

Chapter 4:

CURRENT CONDITIONS AND MANAGEMENT DIRECTION

In this chapter, Lynx Analysis Units containing DNR-managed land are identified, current conditions of lynx habitat is analyzed, and future management direction is given. The first section identifies sources of map data and highlights assumptions and potential errors. In the second section, lynx habitat on DNR-managed land is analyzed from the largest scale, Ecoprovinces and Ecodivisions. The last section is divided into separate subsections for each Lynx Management Zone. Following a discussion of general habitat conditions and connectivity within each LMZ, current proportions and distributions of lynx habitat components are analyzed by LAU. Management direction is also indicated by LAU within each subsection.

4.1 Map Products and Analyses

4.2 Ecodivisions and Ecoprovinces

4.3 Lynx Management Zones

4.1 Map Products and LAU Analyses

The most widely available and standardized data on vegetation within lynx range is from remote satellite imagery. However, this information is of little use for determining lynx habitat characteristics because most requirements for lynx habitat components can only be determined from on-site inspection. Whereas lynx habitat components involve surface-level attributes (i.e. presence of small stems and branches within a hare's reach or piled woody debris for a den), lynx habitat, by definition, is forested. The forest canopy shields surface attributes from satellite view.

Detailed ground-based survey data was unavailable for DNR-managed lands within lynx range as of November 1996. Therefore, satellite imagery, inventory information, and aerial photographs were combined to estimate the location of potential sites for denning and high quality forage areas. For the above reasons, the habitat maps do not depict verified "habitat." Instead, map locations will guide future ground surveys by directing attention to areas with relatively higher probability of being one category or another. These maps will be used to stratify monitoring efforts indicated in Chapter 6.

In all LMZs, data from the DNRGIS Digital Elevation Model (DEM) were compiled to define major ridges and saddles. Rivers and streams were adopted from the DNR GIS (Loomis State Forest) and WDFW WARIS (all other areas) data layers. These items are accompanied by a 300 foot (91m) wide buffer on the maps (600 feet or 183m, total). Minor ridges and saddles not depicted may also be important. Lynx occurrences represent sightings or trapping records and were adopted from the WDFW PHS database. Transportation route data was compiled from the WDFW-USGS transportation layer. LAU boundaries were obtained from WDFW for all zones except for outside of the Loomis State Forest within the Okanogan Zone. Until the latter boundaries are available from WDFW, WAU boundaries from DNR GIS have been adopted. None of the maps were systematically ground-truthed, although some qualitative comparisons were made.

The specific criteria used to delineate lynx habitat categories for analysis and maps are detailed in Table 13. Although relatively more detailed information was available within Loomis State Forest from 1993 inventory, data specific to all the definitions of lynx habitat given in Chapter 3 were not collected. Monitoring activities described in Chapter 6 will be designed to

Approximately 30% of the forested stands were surveyed for vegetative characteristics. Inventory data was extrapolated to unsampled areas via aerial photograph comparison. In all other locations, lynx habitat characteristics were estimated using satellite data from Pacific Meridian Resources, Inc. (Table 13). This information represents June - August (1988) Landsat/TM imagery (bands 3, 4, and 5 with a 3/4 ratio). Primary species information was obtained from the Northeast Region inventory, which included sample dates of 1982-1993.

Table 13: Translations of lynx habitat components to inventory records/DNRGIS data used in analysis of DNR-managed lynx habitat and maps.

Map Habitat Elements	PHS Definitions*	Translated to Loomis Inventory	Translated to Inventory in Other Zones
Open Areas	1) roads 2) non-forest areas >300ft wide: meadows, marshes, rock outcrops, open water, seedling/grass/forb areas 3) forested areas: less than 4,700 stems and boughs <4 ft above snow level 4) <180 trees per acre, <8ft tall	1) roads 2), 3), and 4) as defined by PHS, except those categorized as Temporary Non-lynx Areas and no width limit	1) roads 2) following PHS except width limit; through Land Use, Land Cover classifications
Temp. Non-Lynx Areas	(included as Open Areas)	logged or burned stands <15 yrs. old and/or field check for height	"other lands in forested areas" (includes <10% crown closure conifer or >75% hardwood; clearcuts, meadows, etc.)
Forage Habitat	≥ 4,700 -14,000 stems and boughs per acre less than 1/4" in diameter; ≥ 1,210 tpa, ≥6ft spacing, ≥ 8ft tall	1) ≥ 1,000 tpa, <20ft tall in two categories: a. size-- either 1-3" dbh or <3" dbh b. species-- lodgepole pine or "other"	>10% but <70% crown closure of conifer and <75% hardwood/shrub (early seral)
Travel Habitat	>180 tpa, 16 ft spacing, >8 ft tall	≥ 180 tpa, ≥7ft tall	>70% crown closure of conifer with <75% hardwood/shrub (mid and late seral)
Current Denning Habitat	1) ≥60% canopy closure, mature (150+ yr) lodgepole/spruce/subalpine fir 3) many large (≥6"diam.), downed logs covering 50% of the area, layered 1-4ft tall 4) ≥5 acres, N or NE aspect	1) subalpine fir or Engelmann spruce stands >90 yrs. old 2) ≥5 acres	mature stands with ≥ 15,000 BF (10,000 BF in Okanogan LMZ), climax species as primary species
Potential Denning Habitat	(included as Denning Habitat)	1) ABLA2 associations** 2) N or NE aspects	N or NE aspects
Travel Corridors/Travel Routes	≥300 ft along prominent ridges, saddles, and streams	300 ft forested buffer along prominent ridges, saddles, and streams	300 ft forested buffer along prominent ridges, saddles, and streams

*WDFW (1996); **Williams and Lillybridge (1983)

It is important to emphasize that simplifying assumptions were made to fit available habitat data into lynx habitat categories (Table 13). In particular, note that the Temporary Non-lynx Area category outside of the Loomis State Forest may contain other cover types than recent harvest units or burned areas (e.g. meadows and deciduous stands). Stands classified as Forage Areas may indeed have short, dense coniferous growth, but they may not qualify as actual Forage Habitat if there are no branches or stems within a hare's reach. Forage Areas indicated by satellite imagery may also be old, sparse stands. They would still qualify as Forage Habitat if there was enough small diameter vegetation to provide cover 3.3 feet (1m) above snow level.

Likewise, it is important to emphasize that the information on current conditions in the following sections is only as reliable as the data that went into them. Although recent data were available for 75% of DNR-managed lynx habitat (Loomis State Forest), the landscape on the remaining 25% has probably changed significantly in some places since the satellite images were taken. In particular, recent fires within the Okanogan and Kettle Range LMZs are not depicted, nor are recent harvest units outside of the Loomis State Forest. However, eight years (1995-1988) is a small percentage of both the relative rotation length of a stand, and the length of time a stand is categorized as a particular habitat category (for example, a stand may be classified as a Temporary Non-lynx Area for 15-20 years, as a Forage Habitat for 20-40 years, or as a Denning Habitat for many decades).

It is anticipated that this analysis will provide a valuable baseline for future lynx habitat analyses, especially outside of the Loomis State Forest. The satellite images were taken immediately after the conclusion of lynx studies in northcentral Washington (Koehler 1990a). Low recruitment in lynx was documented at that time. Few lynx or lynx tracks were documented per year before 1988 (WDW 1993). After eight more years (15 years after initial data collected, enough time for at least some of the Temporary Non-lynx Areas to mature into Forage Habitat), a re-analysis of habitat data will enable determination of habitat trends. This information could then be used in combination with future lynx studies to correlate effects of large-scale habitat change on lynx.

4.2 Ecodivisions and Ecoprovinces

4.2.1 Importance to Lynx

Differences in lynx habitat quality between the large-scaled ecoprovinces can only be inferred from sightings and fur harvest records, as research data is unavailable. The naturally constricted habitat in the Shining Mountains within Washington may be detrimental to lynx, given the species' avoidance of Open Areas (2.1.4). In British Columbia, trapping reports reveal greater numbers of pelts sold in Region 8 (roughly corresponding to the Thompson Okanogan Highlands) than Region 4 (roughly corresponding to the Shining Mountains), even though Region 8 is smaller than Region 4. For example, in 1986, approximately 70 pelts were sold in

Region 8 compared to 17 in Region 4, and, in 1990, approximately 14 pelts were sold in Region 8 compared to 7 in Region 4 (WDW 1993). This possible relationship is speculative, of course, because trapping reports are notoriously biased (inconsistent trapper effort and a host of other disclaimers, see Todd 1985, Hatler 1988). The testable hypothesis is that the Thompson Okanogan Highlands supports denser populations of lynx than the Shining Mountains. So far, lynx in Washington have only been studied in the Thompson Okanogan Highlands. For managers of land within the Shining Mountains, there is little research-based information from which to design lynx habitat management or recovery plans.

Human disturbance also likely decreases lynx habitat quality (Koehler and Aubry 1994). Accessibility of lynx habitat within Washington as estimated by road density is similar among the LMZ, except that the two smaller zones have relatively higher road density (Table 14). This may be due to an "area effect", reflecting the influence of relative size of the LMZ. A testable hypothesis would be that lynx density decreases with road density, and/or that lynx alter their pattern of habitat use according to road density.

Table 14: Mean (std. dev.) density (miles per mi²) of transportation routes, trails, ridges and saddles, and rivers and streams within lynx habitat, by Lynx Management Zone.

Lynx Management Zone	Roads (primary, secondary and urban)	4-Wheel Drive Vehicle Trails	Other Trails	Ridges and Saddles	Rivers and Streams
Okanogan	0.37 (0.25)	1.15 (0.15)	0.09 ^a (0.01)	1.19 (0.42)	0.94 (0.33)
Vulcan Mountain	0.39 (n=1)	2.76	0	1.70	0.59
Kettle Range	0.54 (0.15)	0.95 (0.35)	0.40 ^b (0.15)	1.21 (0.19)	0.70 (0.70)
The Wedge	0.28 (0.13)	1.8 (0.52)	0.08 (0.06)	1.96 (0.50)	1.08 (0.17)
Little Pend Oreille	0.21 (0.14)	1.38 (0.60)	0.17 ^c (0.07)	1.70 (0.39)	0.97 (0.19)
Salmo Priest	0.57 (0.15)	1.22 (0.95)	0.16 (0.16)	1.55 (0.32)	1.08 (0.24)

^aThe three WAU's south of Loomis State Forest reported no trails and were therefore excluded from this statistic.

^bLAU 4, 5, and 6 reported no trails and were therefore excluded from this statistic.

^cLAU 21 reported no trails and was therefore excluded from this statistic.

4.2.2 General Characteristics

The cooler, moister climate of the Humid Continental Highlands is expressed in the major climax communities of the Shining Mountain Ecoprovince (Table 15), particularly the presence of interior western red cedar/western hemlock forests. Also, the density of rivers and streams is generally higher in the eastern than western LMZ (Table 14). The common occurrence of lodgepole pine forests attests to the drier, harsher climate of the Thompson Okanogan Highlands. Likewise, a slightly shorter fire return interval has been observed in the Highlands (G. Sinnett, unpubl. DNR data). Lodgepole pine is still a common seral species in the Shining Mountains, but succession often leads to Engelmann spruce/subalpine fir forests on the mid-slopes of the mountains. In the Thompson Okanogan Highlands, succession to the latter community is often restricted to mesic sites in higher elevations where fire is relatively less frequent (Demarchi and USFS 1994).

4.2.3 Current Conditions

Most of the LMZ have high potential to support lynx, as indicated by the low proportion of Open Areas present. For example, forested lynx habitat could occur on $\geq 95\%$ of all lands within the LMZ outside of the Okanogan Zone (Table 16). However, the long and narrow shape of three of the LMZ may influence lynx persistence by increasing the chance that a random event will cause localized extinction (1.4.2.1) and two of the zones may be too small to support an entire lynx home range.¹⁶ Given the susceptibility of lynx to trapping and their low reproductive potential (e.g. 2-3 kittens per litter), lynx in Washington may still be recovering from overtrapping during the late 1970's and early 1980's (WDW 1993). Nonetheless, a substantial amount of habitat has matured beyond reach of snowshoe hares, and is therefore limited in potential to support lynx.

DNR manages 5% (125,035/2,484,512 acres) of the designated primary lynx range in Washington (WDW 1993). It is the second largest manager of lynx range in Washington, next to the U.S. Forest Service. By proportion, DNR's jurisdiction is nearly equivalent to that of the National Park Service (USDI). Over 75% of the habitat managed by DNR occurs within the Okanogan LMZ, with the remaining <25% scattered within the five other LMZ (Table 17).

Table 15: Major and minor plant communities of the two ecoprovinces within Washington's lynx range.

ECOPROVINCE		
	SHINING MOUNTAINS	THOMPSON/OKANOGAN HIGHLANDS
major climax communities	1) interior western red cedar/western hemlock forests (lower to mid-slopes of Columbia mountains, Bitterroot Ranges, and wetter locations of Rockies and northern Rocky Mountain Trench)	1) bunchgrass steppe/ big sagebrush (low slopes of large basins)
	2) interior Douglas fir/bunchgrass/bitterbrush forests (lower slopes of the Clark Fork river valley and southern Rocky Mountain Trench)	2) interior Douglas fir/bunchgrass forests (lower elevations of plateaus)
	3) Engelmann spruce/subalpine fir forests (mid-slopes of all mountains)	3) Douglas fir/lodgepole pine/pinegrass forests (higher elevations of plateaus)
	4) dry and rocky alpine tundra (mountain summits)	
minor climax communities	ponderosa pine/bunchgrass/bitterbrush forests (southern Rocky Mountain Trench)	Engelmann spruce/subalpine fir forests (higher elevations of plateaus and mid- to upper elevations of mountains)
	Douglas fir/lodgepole pine/pinegrass forests (valleys and lower slopes of Continental and Border ranges of the Rockies and eastern Purcell Mountains)	alpine tundra (highest slopes)
	interior Douglas fir/grand fir forests (mid-slopes of the Coeur d'Alene Mountains and the Clark Fork Valley)	ponderosa pine/ bunchgrass/ rabbitbrush parkland (mid-slopes of large and dry basins)
	quaking aspen/rough fescue parkland (lower slopes of the Rocky Mtn. foothills)	

adapted from Demarchi and USFS (1994)

Table 16: Total acres, lynx habitat potential, number of LAU stratifications, and estimated lynx populations within the LMZ.

Lynx Management Zone	Acres (% Managed By DNR)	Lynx Habitat*	Number of LAU's (DNR Lands)**	Estimated Lynx Population***
Okanogan	1,882,884 (5%)	84.8%	? (3 LAU's +3 WAU's)	50-128
Vulcan Mountain	4,246 (4%)	95.5%	1 (1)	0-1
Kettle Range	234,783 (0.9%)	98.0%	9 (4)	12-23
The Wedge	44,258 (5%)	98.9%	3 (3)	5
Little Pend Oreille	158,455 (13%)	99.5%	9 (7)	10-15
Salmo Priest	182,386 (2%)	99.6%	7 (3)	19

*Total acres minus natural openings, talus slopes, open water, and sparsely forested areas.

**WDFW, pers. commun.

***WDW (1993): based on the average density of lynx in Washington of 2.5 lynx/100km² (Brittall et al. 1989, Koehler 1990a) extrapolated to currently suitable lynx habitat in Washington (2.1.4)

4.2.4 Implications for Lynx Habitat Management

The only location where lynx have been studied in Washington is in the Semi-Arid Steppe Highlands of northcentral Washington (Brittall et al. 1989, Koehler 1990a). Given the differences in climate and vegetation between ecoregions, differences between definitions of lynx and hare habitat likely exist between areas. Two main differences are expected: 1) hares will be found in midsuccessional forests of other species in addition to lodgepole pine, and 2) mature forests with understories of shrubs or young conifers will be used more frequently in eastern than western lynx range due to their increased availability in eastern lynx range. Habitat recommendations based on data from western lynx range should be interpreted cautiously in eastern lynx range, focusing on the recommended structure rather than species, when species are mentioned. Future monitoring will address these hypotheses (Chapter 6).

Table 17: DNR-managed lands within the Lynx Management Zones of Washington.

Zone	County	LAU with DNR Land	DNR Land (acres, % LAU)	WRIA with DNR Land	WAU with DNR Land	Legal Description
Okanogan	Okanogan	North	25,010 (100%)	Okanogan	Similkameen R., Chopaka, NF Toats	T40N R24E, T39N R24E, T40N R25E, T39N R25E
		Central	33,778 (100%)		SF Toats, Cecile Ck.	T38N, T37N, and R23, 24, and 25E
		South	30,786 (100%)		Sinlahekin, Fish Lk, NF Salmon Ck.	T36N, T37N, and R23, 24, and 25E
		Other*	50,369 (7%)		NF Salmon Cr. WF Salmon Cr. Summit Cr.	T36N R24E S34,36 T36N R24E S34 T34N R24E S20,21,28,29,30,31
Vulcan Mountain	Ferry	1	172 (4%)	Kettle	Gosmus	T40N R33E S16
Kettle Range	Ferry	3	74 (0.3%)		Lone Ranch	T39N R34E S24, 25
		4	1,599 (9%)		East Aenas	T39N R34E S25, 34-36
		6	15 (0.1%)	Sanpoil	O'Brien Creek	T36N R34E S16
		7	239 (0.8%)	Middle Lk. Roosevelt	Lower Sherman Creek	T36N R37E S16
				Kettle	Deadman Creek	T37N R36E S16
The Wedge	Stevens	11	656 (5%)		Pierre	T40N R37E S36
		12	1,336 (10%)	Upper Lk.	Big Sheep Creek	T40N R38E S12,16; T40N R39E S16, 19
		13	951 (5%)	Roosevelt	Crown Flat	T40N R38E S36; T39N R38E S3
Little Pend Oreille	Stevens/ Pend	14	364 (2%)		Cedar Creek N. Fork Deep Cr.	T39N R42E S16 T40N R42E S36
		15	91 (0.4%)		Box Canyon	T38N R42E S16; T40N R42E S36
	Oreille	16	1,016 (6%)		Aladdin	T38N R41E S36
				Pend Oreille	Ruby Creek Muddy Creek	T37N R42E S7,18,20 T38N R42E S16

*LAU boundaries not yet delineated by WDFW for this area.

Table 17 (cont.): DNR-managed lands within the Lynx Management Zones of Washington.

Zone	County	LAU with DNR Land	DNR Land (acres, % LAU)	WRIA with DNR Land	WAU with DNR Land	Legal Description
Little Pend Oreille	Oreille	17	1,665 (14%)	Colville	Bon Ayre	T36N R41E S26,27,34; T36N R40E S36
					Mid. Little P.O.	T35N R41E S5,6
		18	14,271 (57%)	Pend Oreille	Ruby Creek	T36N R42E S27,33; T35N R42E S9,16
		19	555 (4%)	Colville	Lakes	T35N R42E S4-9,16,17; T36N R42E S16,19,20,21,27-33; T35N R41E S1-3,12; T36N R41E S25,26,34-36
		22	173 (2%)	Pend Oreille	Tenmile Creek	T32N R42E S6; T33N R41E S36
Salmo	Pend	27	627 (3%)		Le Clerc Creek	T36N R44E S36
Priest	Oreille	28	2,453 (10%)		Middle Creek	T33N R45E S18,20,30,31; T35N R44E S12,14
		29	640 (4%)		Skookum	T34N R44E S36

4.3 Lynx Management Zones

Current lynx habitat conditions are discussed by LMZ and LAU in the sections to follow and a summary table is provided at the end of the chapter (Table 19). In general, all but Okanogan and Vulcan Mountain LMZs currently meet the Forested Habitat ratio, with 64-86% Forested Habitat. The major discrepancy between current conditions and lynx habitat ratios is for Forage Habitat. Within the LMZs outside of the Okanogan LMZ, 59% (17/29) of the LAU's had <10% Forage Habitat, and only 14% (4/29) had >15% Forage Habitat. If Temporary Non-lynx Areas as classified in this evaluation are indeed representative of regenerating stands, the Forage Habitat deficit should decrease within the next decade: five of 29 had less than 15%, and three of 29 had more than 22%. For the Okanogan LMZ, 17% of the entire area was classified as Forage Habitat, with 35% in Temporary Non-lynx Areas.

4.3.1 Okanogan Lynx Management Zone

4.3.1.1 Importance to Lynx

The greatest potential for lynx persistence in Washington is found within the Okanogan LMZ (WDW 1993). Five factors contribute to the value of this zone: 1) the amount and contiguity of

habitat, 2) potential population size, 3) current population, 4) substantial connection to British Columbia, and 5) high potential for land management activities favoring lynx habitat due to the large proportion of public land. Trapping pressure has also been low in this zone, with one to five lynx taken per year, except during 1978-79 when nine lynx were taken. The estimated current lynx population in this zone is 50-128 animals (WDW 1993).

4.3.1.2 General Characteristics

Six WRIA's (Methow, Chelan, Entiat, Okanogan, Upper Skagit, and Wenatchee) occur within the Okanogan LMZ. Encompassing over 1.88 million acres (760,210 ha), this is the largest zone within the primary lynx range delineated by WDW (1993). Most (77%) of the lynx habitat managed by DNR occurs within this zone, but this amounts to only 5% of the LMZ (Fig. 13). The southwestern third of the zone is characterized by large quantities of Open Areas and Temporary Non-lynx Areas, whereas the north and east are largely covered by coniferous forests. The abundant Open Areas contribute to the relatively low proportion of the zone potentially available as lynx habitat (85%, Table 16). Of the Forested Habitat, 48% currently classified as Travel Habitat, 17% as Forage Habitat, and 35% as Temporary Non-lynx Areas. The northern border of the lynx zone is directly connected with British Columbia for 56 miles (90 km).

DNR manages lynx habitat within ten WAU's, mostly within the Okanogan WRIA (Table 17). The area includes part of a major north-south ridge travel route that extends from British Columbia to the southern border of the LMZ, on the eastern peninsula of the Summit Creek WAU. Other potentially important travel routes are east-west extensions of this main route. Open Areas occur within most of the WAU's containing DNR-managed land. All but 4% of the acreage under DNR's jurisdiction is within a contiguous block called the Loomis State Forest. Lynx habitat within the Loomis State Forest is stratified by three LAU's (Loomis North, Central, and South, Fig. 14).

Approximately 89% (79,548/89,576 acres or 32,167/36,221 ha) of the lynx habitat within the Loomis State Forest has potential to be forested lynx habitat (11% Open Areas, Fig. 15a). Although 25% of the area is classified as Forage Habitat, only 0.7% (556 acres or 225 ha) of this is associated with young stands of lodgepole pine, the most consistently used hare habitat of those studied in northcentral Washington (Koehler 1990b). Temporary Non-lynx Areas cover >13% of the Loomis State Forest, indicating future Forage Habitat. Potential Denning Habitat occurs on 5% of the area.

Elevations increase to those favored by lynx (4,000 feet or 1,220 m, WDFW 1996) from east to west in the block. Following the elevation gain, Douglas fir associations are replaced by

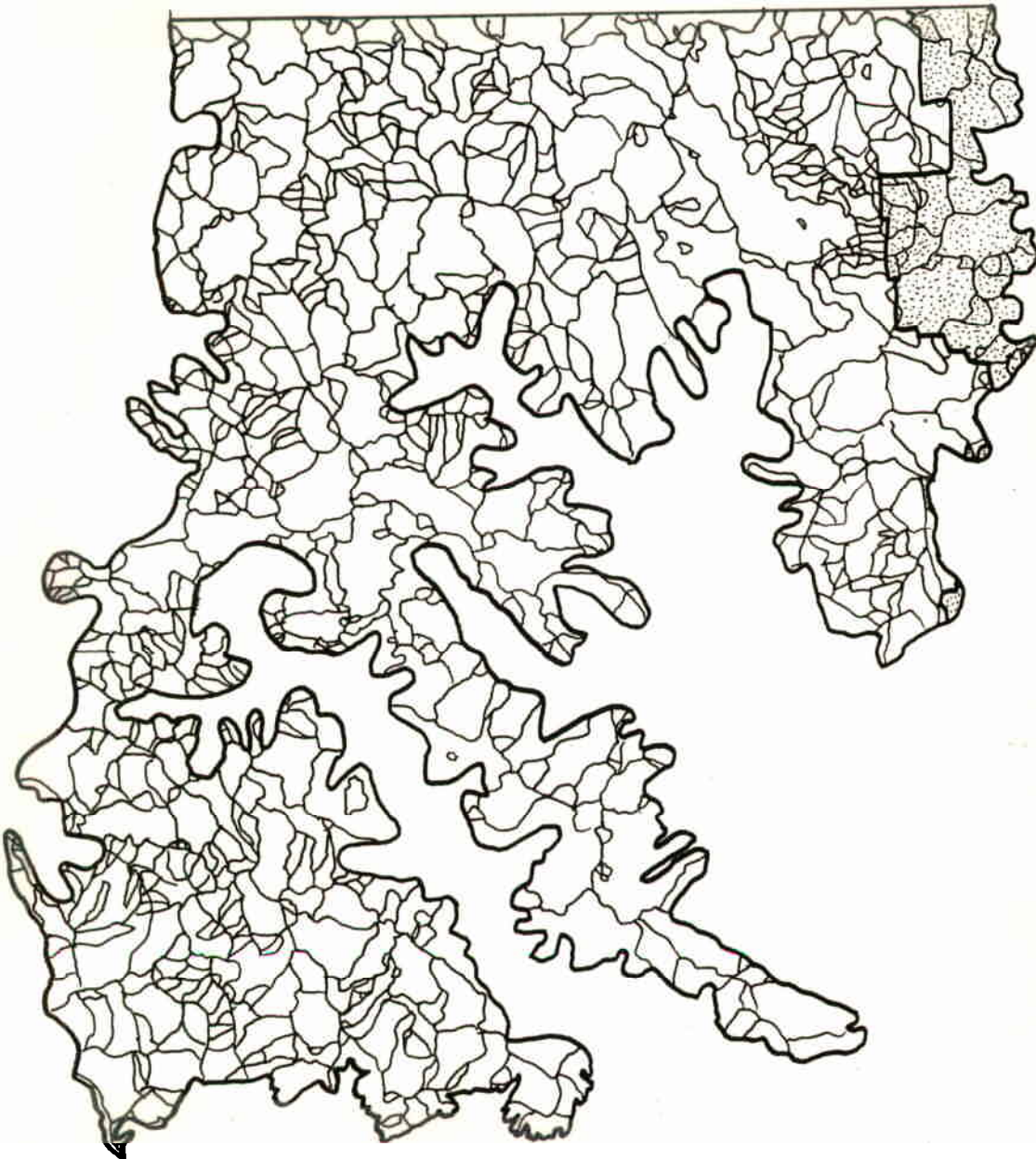
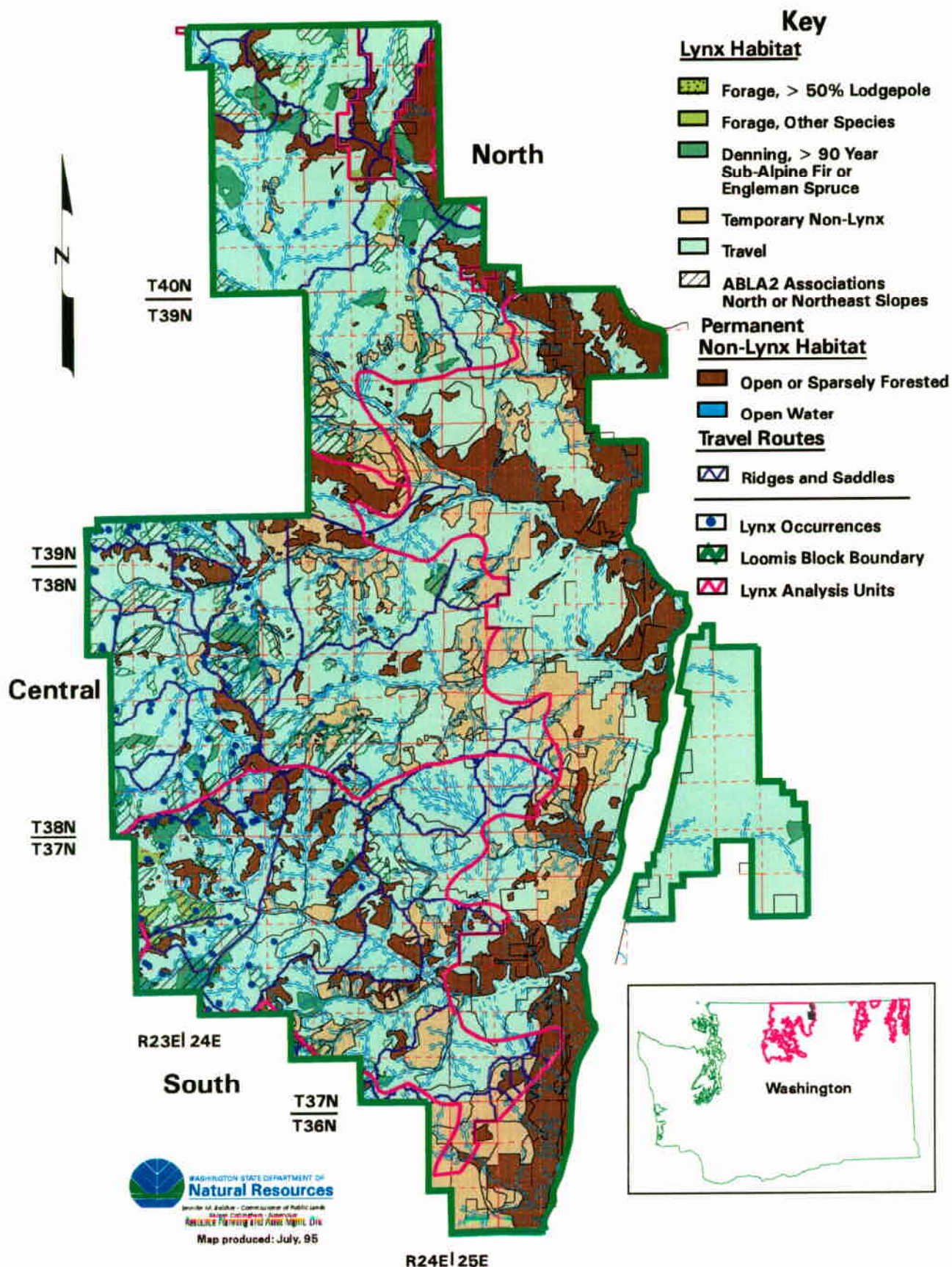
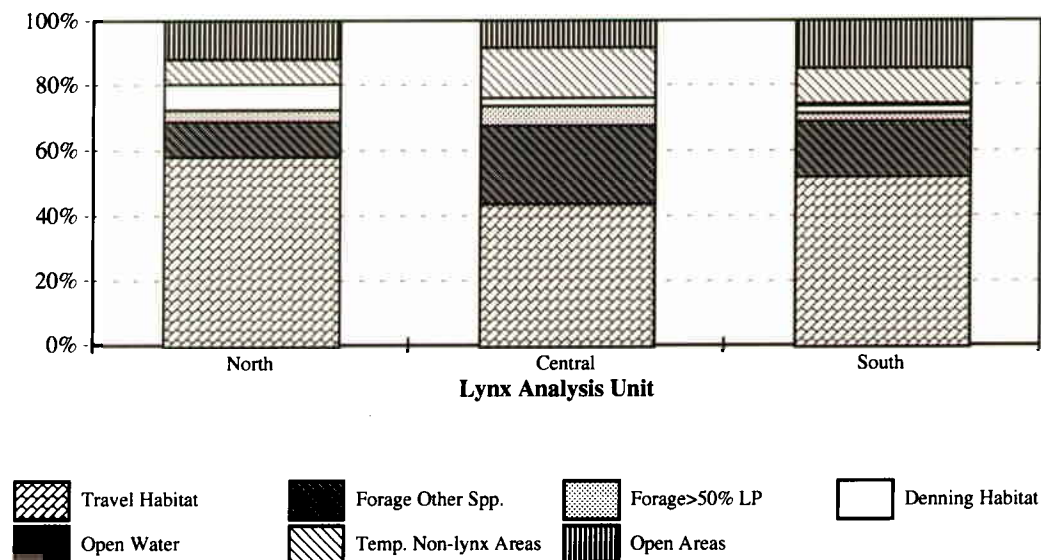


Figure 13: DNR-managed lands and potential ridge travel routes within the Okanogan Lynx Management Zone (dotted, on right).

Figure 14: Current lynx habitat components on the Loomis State Forest within the Okanogan Lynx Management Zone.



a) Habitat categories found within Lynx Analysis Units of the Loomis State Forest:



b) Habitat categories found within the WAU's of Southwest Okanogan:

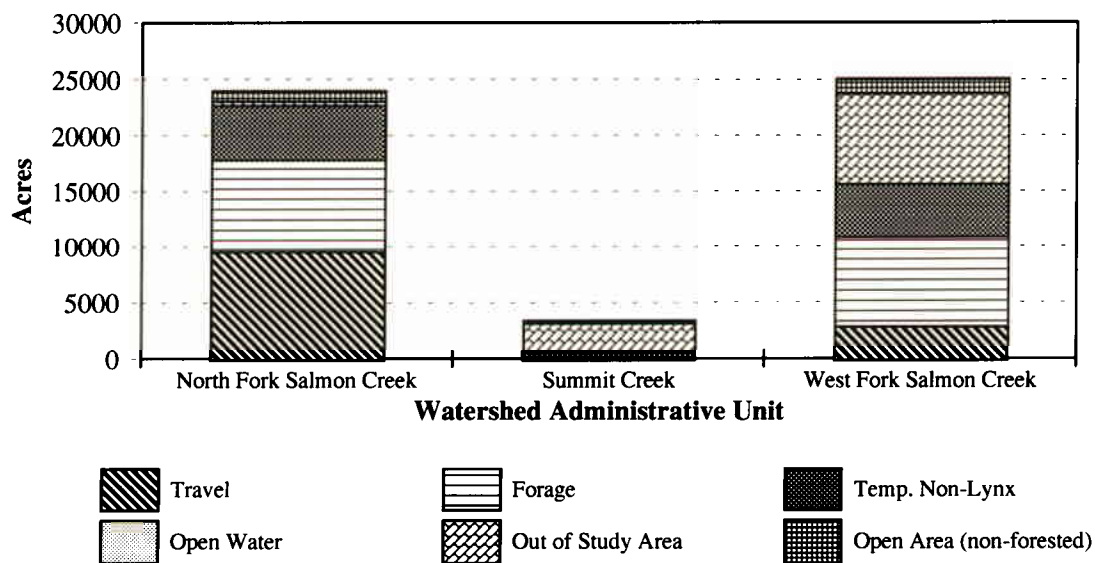
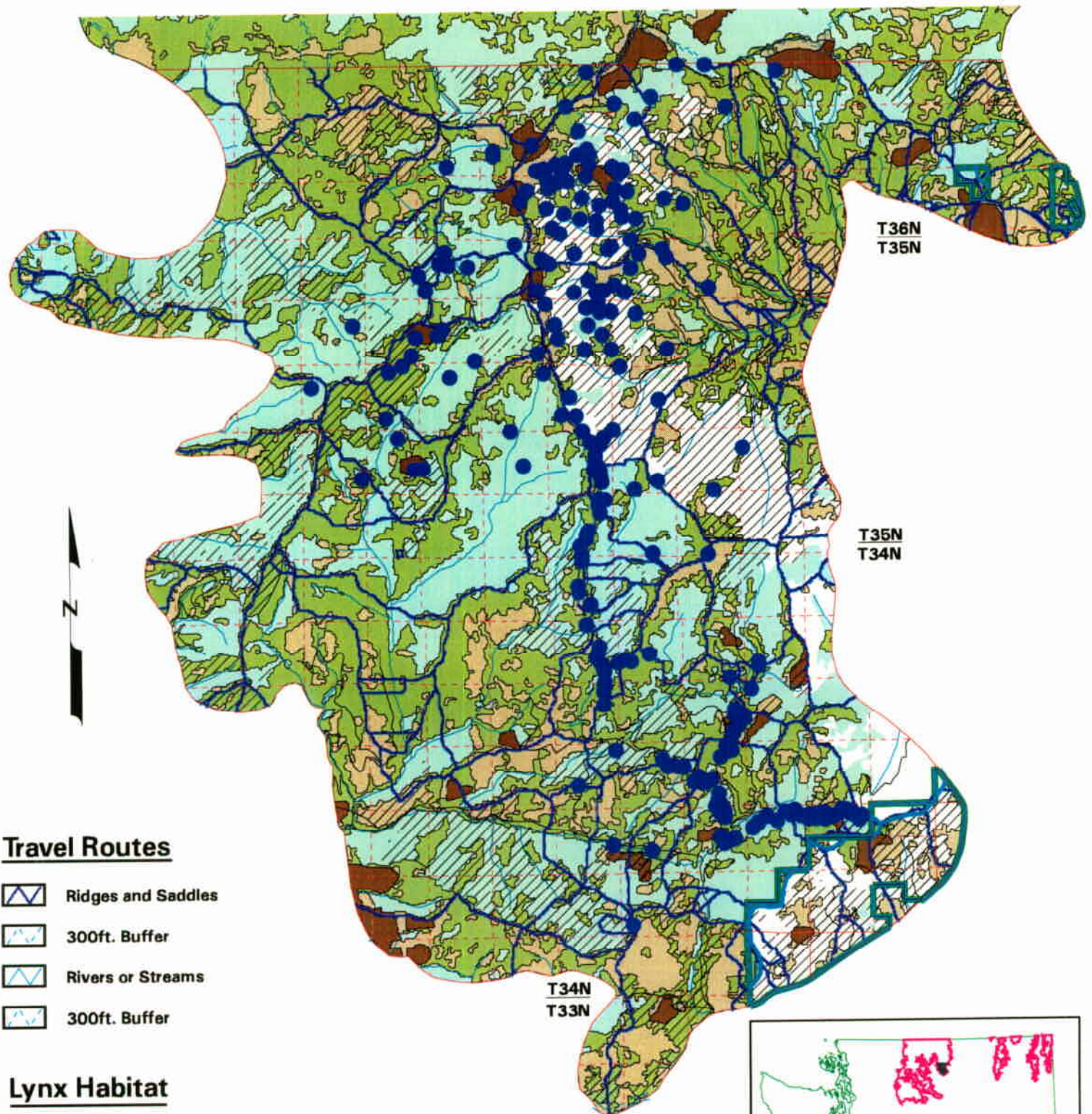


Figure 15: Lynx habitat categories within the Okanogan LMZ: a) Loomis State Forest (FRIS inventory data), and 2) Southwest Okanogan (other inventory and satellite data).






Figure 16: Current lynx habitat components on DNR-managed land within the southern Okanogan Lynx Management Zone. Areas shaded in white indicate that habitat data was not available.






Travel Routes



-  Ridges and Saddles
-  300ft. Buffer
-  Rivers or Streams
-  300ft. Buffer

Lynx Habitat

-  Forage (Early Seral) - > 10% and < 70% crown closure of Conifer, and 75% Hardwood/Shrub
-  Denning Conifer BF > or = 18,000
-  Temporary Non-Lynx
-  Travel
-  North or Northeast Slopes

-  Lynx Occurrences
-  DNR Managed Land
-  Watershed Analysis Units

Permanent Non-Lynx Habitat

-  Open or Sparsely Forested
-  Open Water



WASHINGTON STATE DEPARTMENT OF
Natural Resources

Jennifer M. Belcher - Commissioner of Public Lands
Kaleen Cottingham - Supervisor
Resource Planning and Asset Mgmt. Div.

Map produced: July, 95

subalpine fir associations in a north and west gradient. Much of the lodgepole pine has been affected by the mountain pine beetle. In extensive area, stands of dead trees do not provide adequate lynx habitat unless they have understories that support hare. Dead trees in small quantities can provide cover and/or escape trees, however these habitat components are not currently limiting the lynx populations in Washington (WDFW 1996). Salvage efforts should therefore focus on stands that have little forage value, that is, those lacking dense understories or cover characteristic of Forage Habitat, 3.3 feet (1m) above average snow levels.

DNR-managed parcels outside of the Loomis State Forest occur within the following WAU's of the Okanogan WRIA: North Fork Salmon Creek, West Fork Salmon Creek, and Summit Creek. Much of this southern area was outside the area covered by the satellite data (Fig. 16). Of those areas covered by the satellite, 75% has potential to be lynx habitat (25% Open Areas). Currently, 74% is Forested (32% Travel Habitat, 42% Forage Habitat), as 26% is Temporary Non-lynx Areas (Fig. 15b). Primary species present include 60% Douglas fir, 37% ponderosa pine, and 3% lodgepole pine.

4.3.1.3 Current Conditions and LAU-Specific Recommendations

Loomis-North

The northern-most LAU of the Loomis State Forest, drained by North Fork Toats Coulee Creek and its tributaries, likely has the highest potential of the three Loomis LAU's to support lynx due to its relative inaccessibility (including 2,645 acres [1,070 ha] of Chopaka Natural Area Preserve), large proportion (61%) of subalpine fir plant associations (currently lodgepole stands, Fig. 17) and rolling topography. Lynx with kittens have been known to occupy stands within the northeastern part of the LAU (WDFW, pers. commun.).

Most (89%) of the North LAU has potential to be forested lynx habitat, with 11% in Open Areas, generally on the eastern side of the LAU or on the south facing slopes of the ridges. The orientation of the Open Areas from northwest to southeast may create connectivity problems, especially in T40N R24E S16-17. Although travel routes are planned in the area, long and narrow harvest units are recommended to facilitate connectivity. Subalpine fir (68%) and Douglas fir (32%) associations are prominent within the LAU.

Potential Denning Areas cover almost 9% of this LAU (Fig. 15a), but most of the areas lack north or northeast aspects. These areas will be surveyed for potential dens sites, along with stands with mesic associations on north or northeast aspects.

Only three small lodgepole pine Forage stands occur within the LAU (0.2% of the lynx habitat). Another 12% may provide hare browse in the form of less consistently used species (i.e. Douglas

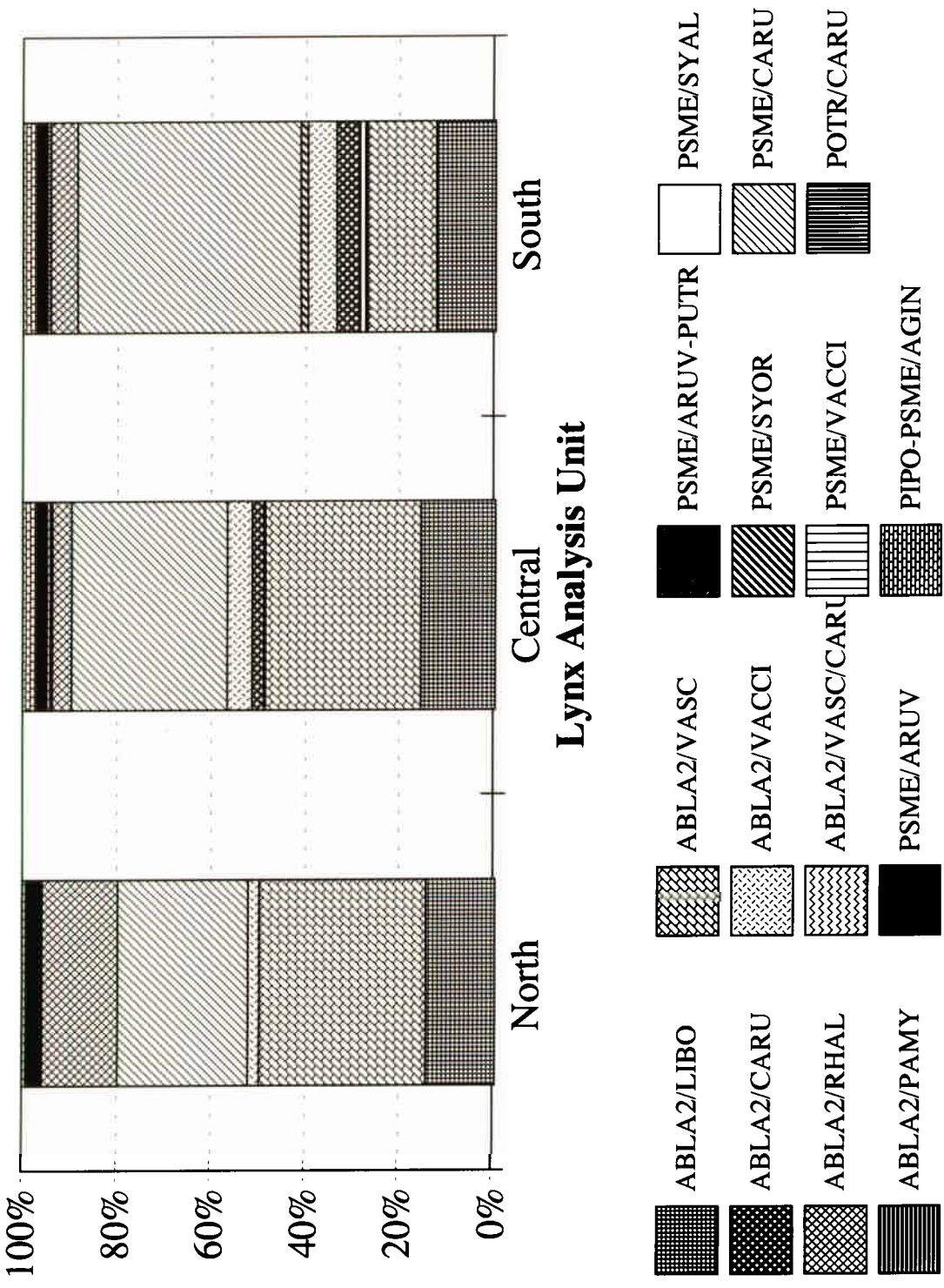


Figure 17: Proportion of vegetative associations of LAU's within Loomis State Forest (FRIS inventory data).

fir and subalpine fir).²² Temporary Non-lynx Areas (9% total) are concentrated in the southern portion of the LAU, likely in Douglas fir dominated stands. Travel Habitat covers 82% of the lynx habitat in the LAU. New Forage Habitat should be planned in lodgepole stands currently classified as Travel Habitat in the southwest corner of the LAU to raise the proportion of Forage Habitat.

Loomis-Central

This LAU has the least proportion of Open Areas (8%) of the three within the Loomis State Forest (Fig. 15a). Lynx occurrences are prevalent in the west, characterized by the predominance of lodgepole pine stands (subalpine fir associations), lack of roads, and abundant slopes with north or northeast aspects (Fig. 14). By contrast, most of the Douglas fir stands (36% of the lynx habitat) and Temporary Non-lynx Areas (17%) occur on the eastern portion of the LAU. Approximately 81% of the lynx habitat within the LAU is classified as Travel Habitat. Potential Denning stands are found in the LAU, but due to the small proportion indicated by DNR inventory (<3%), harvest plans will emphasize searches for Denning Habitat and den sites, especially on slopes with north or northeast aspects.

Provisions for connectivity within the LAU will focus on east-west routes, because Open Areas span the narrow northern connection to Loomis North LAU. Travel routes along river/streams (South Fork Coulee Creek, Cecile Creek and their tributaries) and major ridges are present throughout the area.

Forage Habitat is lacking in this LAU (Fig. 15a). Inventory indicates that stands of potential Forage occur on 26% of the lynx habitat, primarily subalpine fir understory beneath mature lodgepole stands. These areas will be monitored for hare activity. Meanwhile, Temporary Non-lynx Areas should be created in lodgepole pine stands within Travel Habitat that do not have potential Forage value. Subalpine fir associations occur on 61% of the lynx habitat within the LAU (Fig. 17).

Loomis-South

The proportion of Open Areas in the southern LAU is the highest of the three Loomis LAU's (14%). They are concentrated in the center of the LAU, often on south or southwest facing slopes. This LAU also supports the largest proportion of Douglas fir vegetative associations (54%, Fig. 17) and least quantity of Open Water (15 acres, 6 ha) of the Loomis LAU's, perhaps reflecting relatively drier and warmer conditions.

²²These species used in other areas, see Guideline 6a.

One of four potential denning stands occurs on a north or northeast aspect. Due to the small proportion of Potential Denning Habitat within the LAU (<4%), harvest plans will emphasize searches for Denning Habitat and den sites, especially on slopes with north or northeast aspects.

Due to the northwest-southeast orientation of the Open Areas within the LAU, harvest units will be carefully planned to ensure north-south connectivity. This may entail keeping harvest units long and narrow to maintain forested strips at least 330 feet (100m) wide between Open Areas. Travel routes along major streams (Sinlahekin Creek and its tributaries) and ridges are present throughout the LAU.

Forage opportunities in lodgepole pine are limited to 2% of the lynx habitat (Fig. 15a), suggesting that Temporary Non-lynx Areas should be created in lodgepole pine associations of the western LAU. Because only 13% is currently classified as Temporary Non-lynx Areas, consideration should be given to planning harvests within Travel Habitats (81%). Forage could also be created in those stands categorized as "Forage Habitats, Other Species" (20%), if no snowshoe hare activity is detected within the stands. Subalpine fir associations are found on 45% of the lynx habitat in the LAU.

Other: North and West Fork Salmon Creek WAU

One small block of DNR-managed land occurs at the southeast corner of the North Fork Salmon Creek WAU (Fig. 16). This area is dominated by Forage Habitat, interspersed with Travel, Open, and Temporary Non-lynx Areas (Fig. 15b). No Potential Denning Habitat is indicated by high volume stands, but there are some slopes with north-northeast aspects that will be searched for potential den sites. DNR-managed land is largely surrounded by Temporary Non-lynx Areas to the west and southwest, including a ridge travel route. Forested cover will be maintained along the route. DNR-managed land is connected to other forested habitats in the northwest.

The other small block, south of North Fork Salmon Creek, contains mostly high volume Potential Denning Habitat, with small patches of Forage, Travel, and Temporary Non-lynx Areas on the southern third of the block. If den sites are confirmed within the Potential Denning Habitat, these stands may indeed play a vital role to lynx in this LAU. The Potential Denning Habitat is also well connected via ridges to other parts of the zone. Most of the eastern half of the WAU is in early successional habitat. Den sites should be located near this potential Forage Habitat to maximize access to breeding lynx. Both ridge and river/stream (North Fork Salmon Creek tributary) travel routes occur within the block to provide connectivity.

Other: Summit Creek WAU

Information is not available for evaluation of habitat types from satellite images on most of this block (southeast edge of the WAU, Fig. 16). However, there appears to be three Potential

Denning areas (the largest one connected to Travel Habitat within the zone via ridge travel routes), some Forage Habitat, and three blocks of Open Areas. Temporary Non-lynx Areas dominate a large portion of the habitat depicted by the satellite, suggesting that Forage Habitat will increase in the next decade or so. The area is connected by many travel routes; it is encompassed by a northeast-southwest ridge and has five other north-south ridges.

4.3.2 Vulcan Mountain Lynx Management Zone

4.3.2.1 Importance to Lynx

Moving eastward across the state, the next zone encountered is Vulcan Mountain. Due to its small size, this zone has the least potential to support persistent lynx populations if considered in isolation from British Columbia. The current estimated lynx population in this zone is 0-1 animals (WDW 1993). However, the zone retains importance by potentially providing the southern portion of a lynx home range. Evidence supporting this possibility comes from WDW (1993) communications with a B.C. fur trapper. Vulcan Mountain may also function as a dispersal route between B.C. and the Kettle Range Zone, as the distance between zones is traversable by lynx in one day (5-6 miles, 8-10 km). Loss of this zone as lynx habitat would increase the isolation between the Okanogan and other LMZ in Washington.

4.3.2.2 General Characteristics

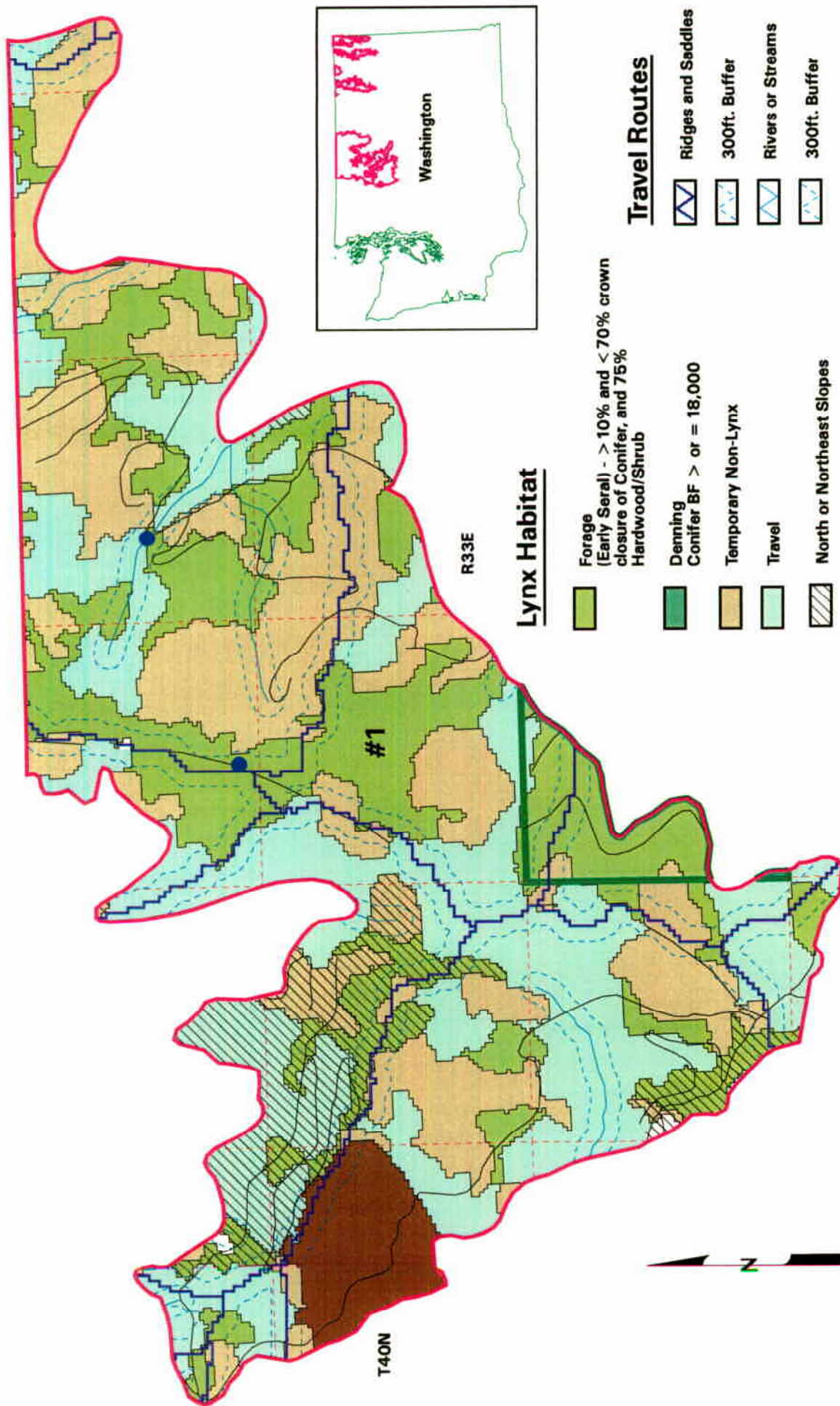
This 4,246 acre (17 km²) zone is entirely within the Kettle WRIA (Ferry County), subdivided into two WAU's, and classified as LAU 1 (Table 17). With only one contiguous block of Open Area on its western border (190 acres, 77 ha), most (96%) of this zone has the potential to be managed for forested lynx habitat.

DNR manages 4% of the zone, in one contiguous block along the southeast edge within the Gosmus WAU (Fig. 18). The 172 acres (70 ha) contain one of two primary east-west corridors that provide connectivity within the LMZ.

4.3.2.3 Current Conditions

Of all the LMZ, Vulcan Mountain has the highest percent of Temporary Non-lynx Areas (33%, Fig. 19a). Forested habitat amounts to 67% of the lynx habitat. Although most of the Temporary Non-lynx Areas are dispersed as large patches to the north and west of DNR-managed land and

Figure 18: Current lynx habitat components within the Vulcan Mountain Lynx Management Zone.



Lynx Habitat

- Forage (Early Seral) - > 10% and < 70% crown closure of Conifer, and 75% Hardwood/Shrub
- Denning Conifer BF > or = 18,000
- Temporary Non-Lynx
- Travel
- North or Northeast Slopes

Travel Routes

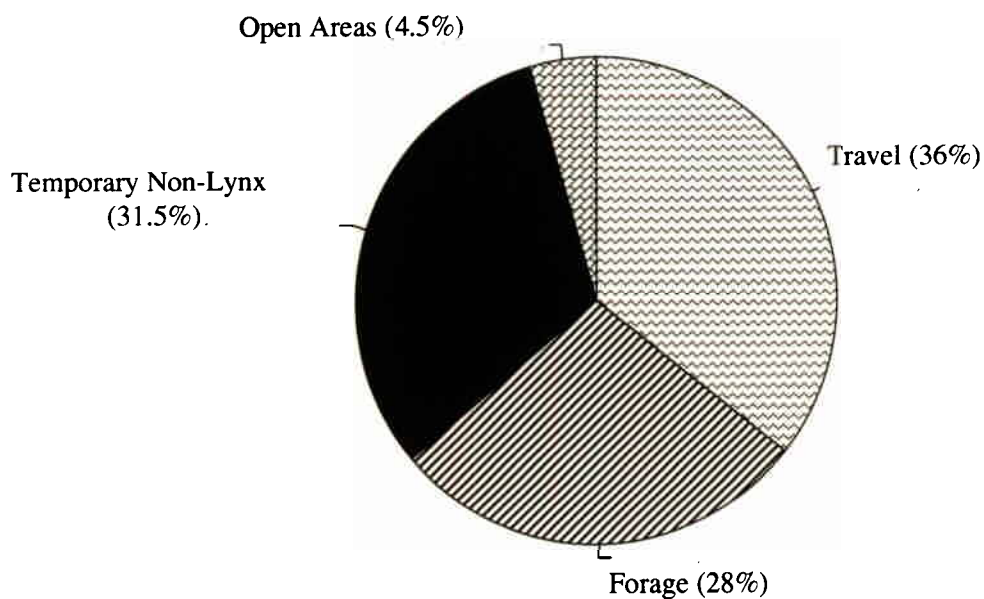
- Ridges and Saddles
- 300ft. Buffer
- Rivers or Streams
- 300ft. Buffer

Permanent Non-Lynx Habitat

- Open or Sparsely Forested
- Open Water

- Lynx Occurrences
- DNR Managed Land
- Lynx Analysis Units

a) Habitat categories within the Lynx Analysis Unit containing DNR-managed land:



b) Primary species on DNR-managed lands within the LAU:

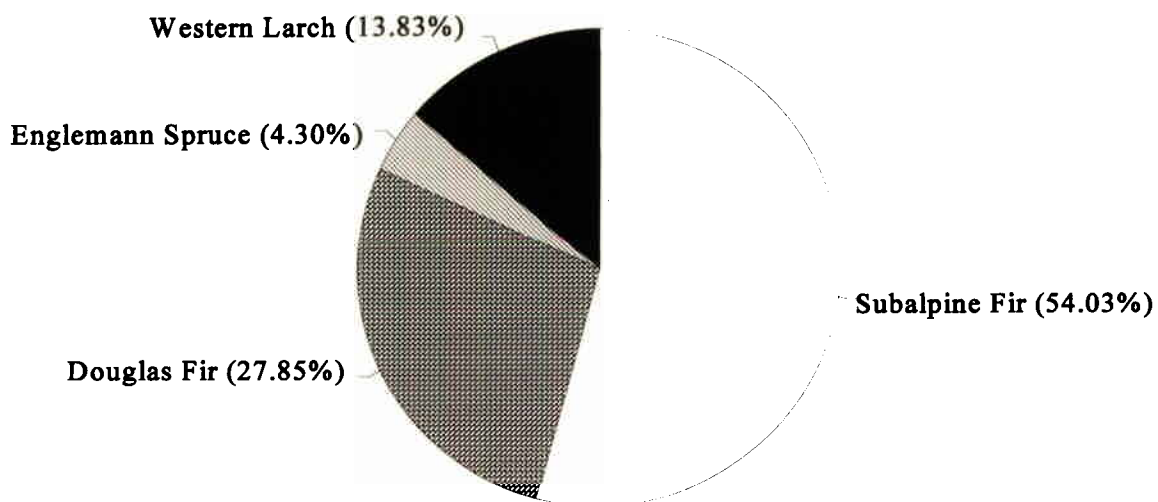


Figure 19: Characteristics of lynx habitat within the LAU containing DNR-managed land within the Vulcan Mountain LMZ: a) habitat categories, and b) primary species (inv./satellite data).

are wide enough to potentially impede movement within the zone, most of the major ridges within the zone are still forested, or there are adjacent, alternative forested travel routes (Fig. 18). This connectivity should promote lynx access to DNR-managed land, which is nearly all categorized as Forage Habitat. Most of the land managed by DNR is bordered by Travel Habitat. No high volume Potential Denning Habitat stands were indicated from inventory data, but there are some acres with a north/northeast aspect that might have potential for future den sites. Primary species of the block included subalpine fir and Douglas fir, with minor components of western larch and Engelmann spruce (Fig. 19b).

4.3.2.4 LAU-Specific Management Direction

DNR is not a major land manager in this LAU. Activities in other LAU's where DNR has more potential to contribute to the recovery of lynx should take precedence over activity here. However, surveys for potential den sites will accompany harvest activities planned in the area.

4.3.3 *Kettle Range Lynx Management Zone*

4.3.3.1 Importance to Lynx

Containing the second largest block of lynx habitat in Washington, the Kettle Range LMZ continues to support lynx as indicated by recent sighting and tracking records. However, past trapping (66 lynx were trapped in Ferry County during 1970-1980, WDW 1993) activities and habitat alteration have reduced the potential of this LMZ to support viable lynx population to third among the six zones. This is the only zone lacking direct connection to Canada. Nonetheless, it is suspected to support lynx immigrating from British Columbia, coinciding with highs in the lynx cycle there. The influx of lynx over the past 13 years has been low. The estimated lynx population in this zone is 12-23 animals (WDW 1993).

4.3.3.2 General Characteristics

This second largest zone (234,783 acres, 950 km²; Table 16) is located entirely within Ferry County, subdivided by three WRIA's [Kettle (north), Sanpoil (southwest), and Middle Lake Roosevelt (southeast)] and stratified by nine (#2-10) LAU (Table 17). Most of this zone (97%) has potential to be forested lynx habitat, with 3% Open Areas scattered in a north-south orientation in the center of the LMZ. This zone has the lowest connectivity from ridges and saddles outside of the Okanogan Zone (Table 14).

DNR manages 0.9% (1,927 acres, 780 ha) of the zone, mostly in two blocks along the northwest edge within the Kettle WRIA (Fig. 20). The blocks straddle LAU 3 (74 acres, 30 ha; Lone Ranch WAU) and LAU 4 (1,599 acres, 647 ha; East Aenas WAU). In LAU 4, DNR manages east-west travel routes; one along a ridge (also, LAU 3) and several along streams. However, none of the critical north-south routes important for within-zone connectivity are managed by DNR.

On the eastern edge of the zone, DNR manages 1.3% of LAU 7, split into a 125 acre (50 ha) block within the Deadman Creek WAU of the Kettle WRIA and a 114 acre (46 ha) block within the Lower Sherman Creek WAU of the Middle Lake Roosevelt WRIA. Additionally, 15 acres (6 ha) within LAU 6 (O'Brien Creek WAU) and the Sanpoil WRIA are managed by DNR along the zone's western edge.

This LMZ contained mostly Forested Habitat at the time the satellite image was created (82%). Only 13% was Forage Habitat, with another 16% in Temporary Non-lynx Areas (Fig. 21a). The Temporary Non-lynx Areas are clustered on east and south facing slopes. There may be connectivity problems in the two narrowest parts of the zone, between LAU 2-3 and LAU 7-8, where concentrations of Temporary Non-lynx Areas exist. However, there are narrow forested routes through these areas. DNR-managed land is well-connected with Forested Habitat throughout the zone. No high volume Denning Habitat was indicated by inventory data, but there are some acres with a north/northeast aspect that have potential for den sites. Western larch and Douglas fir were the most common primary species identified from inventory records on DNR-managed land (Fig. 21b).

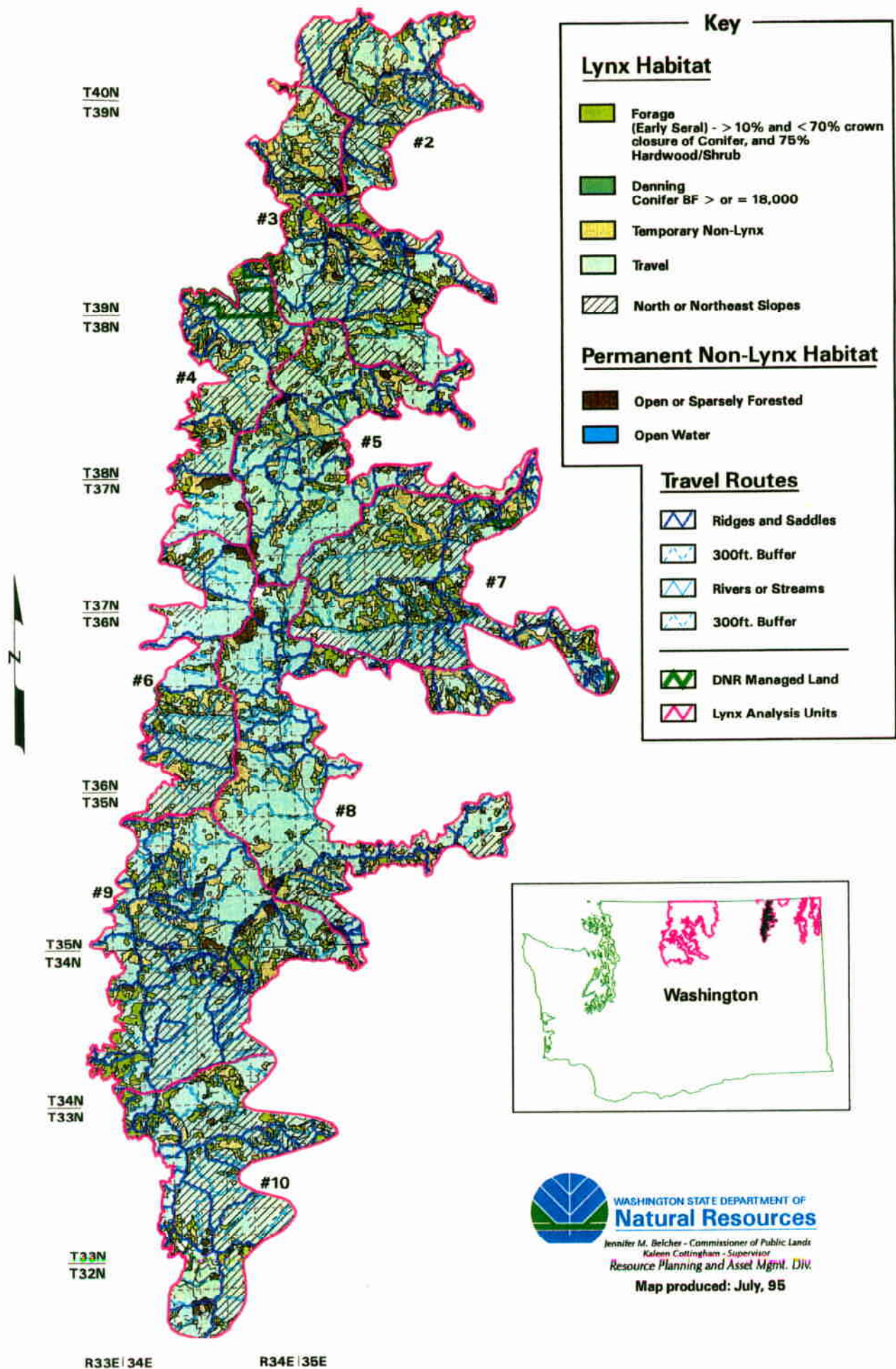
Because the blocks of ownership are small and dispersed, recommendations are grouped and follow the description of DNR-managed lands by LAU.

4.3.3.3 Current Conditions and LAU-Specific Recommendations

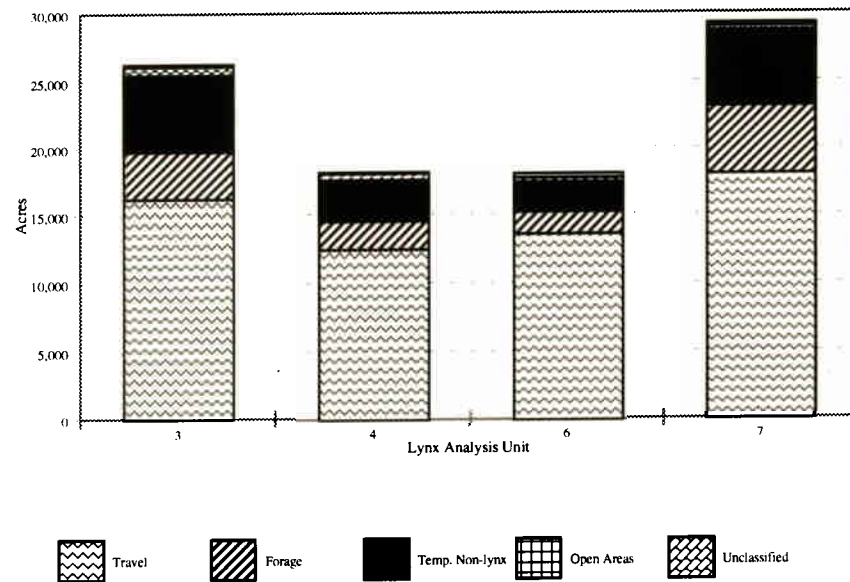
LAU 3

On the southwestern edge of LAU 3, DNR-managed lands were mostly western larch with some lodgepole pine, by primary species. The area is mostly forested, with Forage and Travel Habitat dominating the parcel (Fig. 22). This parcel is too small to significantly influence habitat quality within the LAU, therefore management efforts will concentrate on maintaining quality Forage Habitat and identifying den sites.

Figure 20: Current lynx habitat components within the Kettle Range Lynx Management Zone. Areas shaded in white indicate that habitat data was not available.



a) Habitat categories within Lynx Analysis Units containing DNR-managed land:



b) Primary species on DNR-managed land:

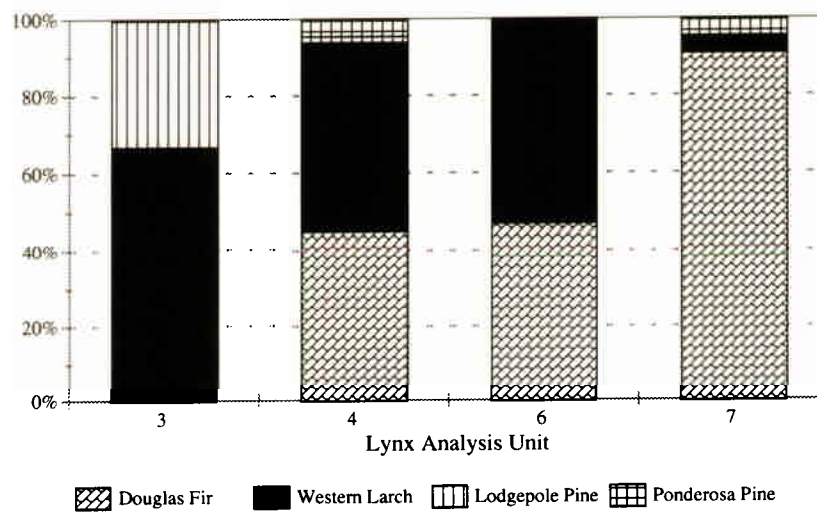
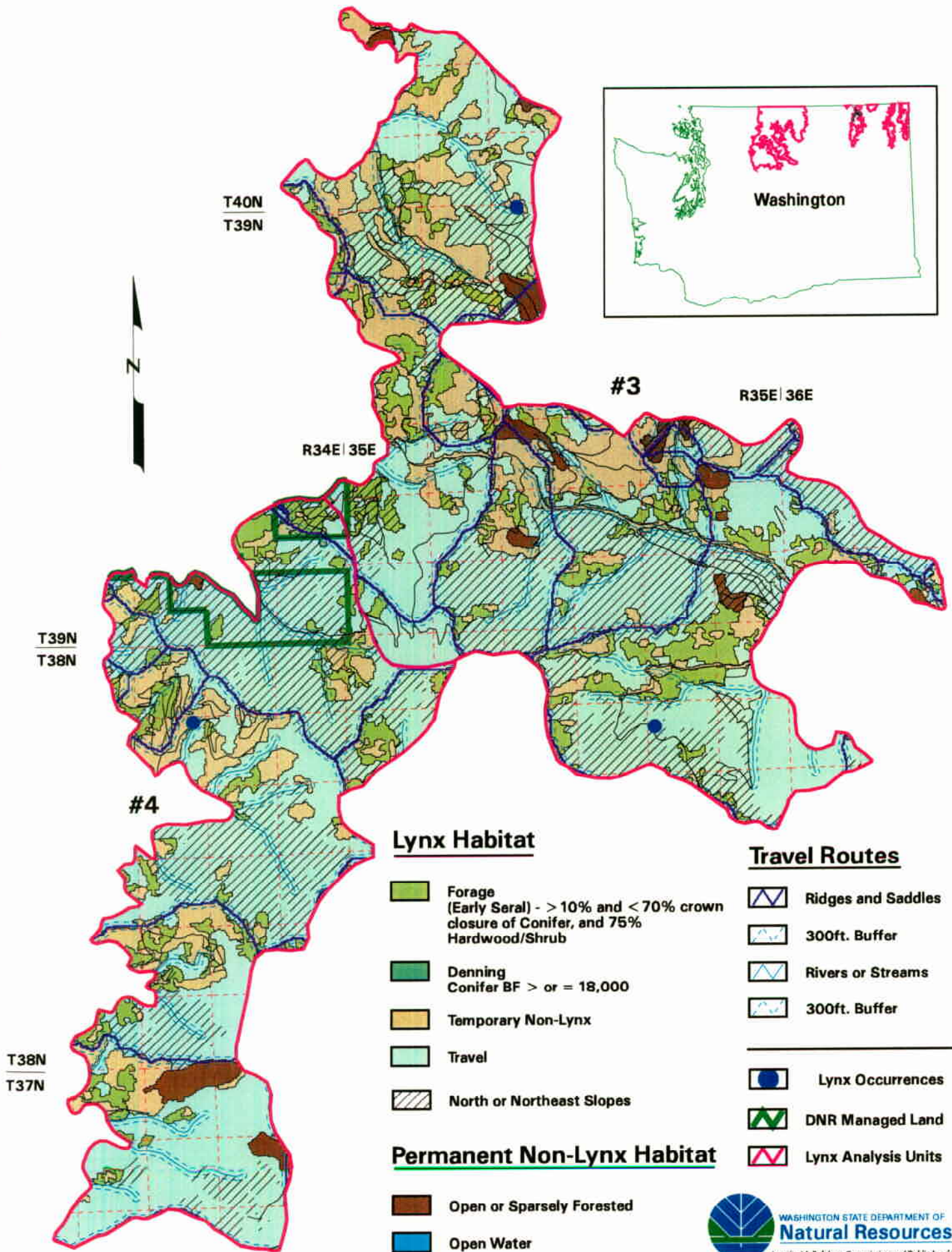


Figure 21: Characteristics of lynx habitat on LAU's containing DNR-managed lands within the Kettle Range LMZ: a) habitat categories, and b) primary species (from satellite/inventory data).

Figure 22: Current lynx habitat components within the Kettle Range Lynx Management Zone:
LAU 3 and 4.



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Kaleen Cottingham - Supervisor
Resource Planning and Asset Mgmt. Div.
Map produced: July, 05

LAU 4

This LAU contains the largest contiguous block of DNR-managed lands within the LMZ, but only contributes 9% of the habitat within the LAU (Fig. 22). Most of the area was forested by either Douglas fir or western larch (primary species, Fig. 21b), but it does contain Open Areas, a small Temporary Non-lynx Area, and several small stands of Forage Habitat. Most have a north-northeast aspect and are connected to Travel Habitat along Long Alec Creek. Travel Habitat with north/northeast aspects will be surveyed for den sites before harvest. The smaller block straddling LAU 3 contained mostly Forage Habitat, with equal sized and smaller patches of Travel Habitat and Temporary Non-lynx Areas, along with one ridge travel route where Forested Habitat will be maintained.

LAU 6

The 15 acres (6 ha) of primarily western larch and Douglas fir (primary species) on the western edge of this LAU are entirely classified as Temporary Non-lynx Areas. Because this is such a small acreage and no travel routes occur on DNR-managed land within this LAU, only the Small Ecosystem guidelines will be applied: i.e. maintain Forage Habitat quality in new harvest units and maintain den sites, if any exist.

LAU 7

Approximately half of the area north of Deadman Creek is Forage Habitat, with the other half classified as Travel Habitat (Fig. 20). DNR-managed lands were dominated by Douglas fir (primary species) when inventoried, with two small patches of Open Areas and one ridge travel route. Forested Habitat will be maintained along this route. South of Bisbee Mountain, along Old Kettle Falls East Road, another 114 acres (46 ha) of lynx habitat were dominated by Douglas fir (primary species) and are nearly all classified as Travel Habitat, lacking Forage and high volume Potential Denning Habitat. These peripheral areas will be managed according to the Small Ecosystem Guidelines.

4.3.4 The Wedge Lynx Management Zone**4.3.4.1 Importance to Lynx**

Habitat within The Wedge has "always been marginal" (WDFW 1993:31). Although this area could potentially support resident lynx, the high accessibility and timber harvest history within the zone may demote its highest value to that of a travel route connecting the Kettle Range and Little Pend Oreille LMZ to British Columbia (WDW 1993), rather than supporting a lynx home

range. The estimated lynx population in this zone is five animals. The high density of roads (Table 14) is indicative of the high accessibility of the area.

4.3.4.2 General Characteristics

This second smallest zone (44,258 acres, 179 km²; Table 16) is subdivided into two WRIA's (Kettle and Upper Lake Roosevelt) and stratified into three LAU's (#11-13) in Stevens County (Table 17). There are relatively higher elevations and a greater proportion of mixed coniferous/deciduous forests in the west than in the east. Most of the zone (98.9%) has high potential as forested lynx habitat, with only 98 acres (40 ha) of Open Areas. The Open Areas are mostly in LAU 12, on the eastern edge of the LMZ.

DNR manages 7% of the land within this zone. The 2,944 acres (11.9 km²) are scattered into three square-mile blocks, and six smaller parcels. The parcels are well connected to Travel Habitat in the zone. Ridge and river/stream travel routes are especially concentrated in LAU 13. Much of the zone is classified as Temporary Non-lynx Areas, but DNR-managed lands are contributing Forage Habitat in LAU 12 and 13 (Fig. 23).

Most of this zone is currently Forested (86%), with 18% in Temporary Non-lynx Areas (Fig. 24a). Of all the zones, it contains the highest proportion of Forage Habitat (16%) and density of ridges and saddles (Table 14). Douglas fir was the most common primary species in LAU containing DNR-managed land, followed by western larch.

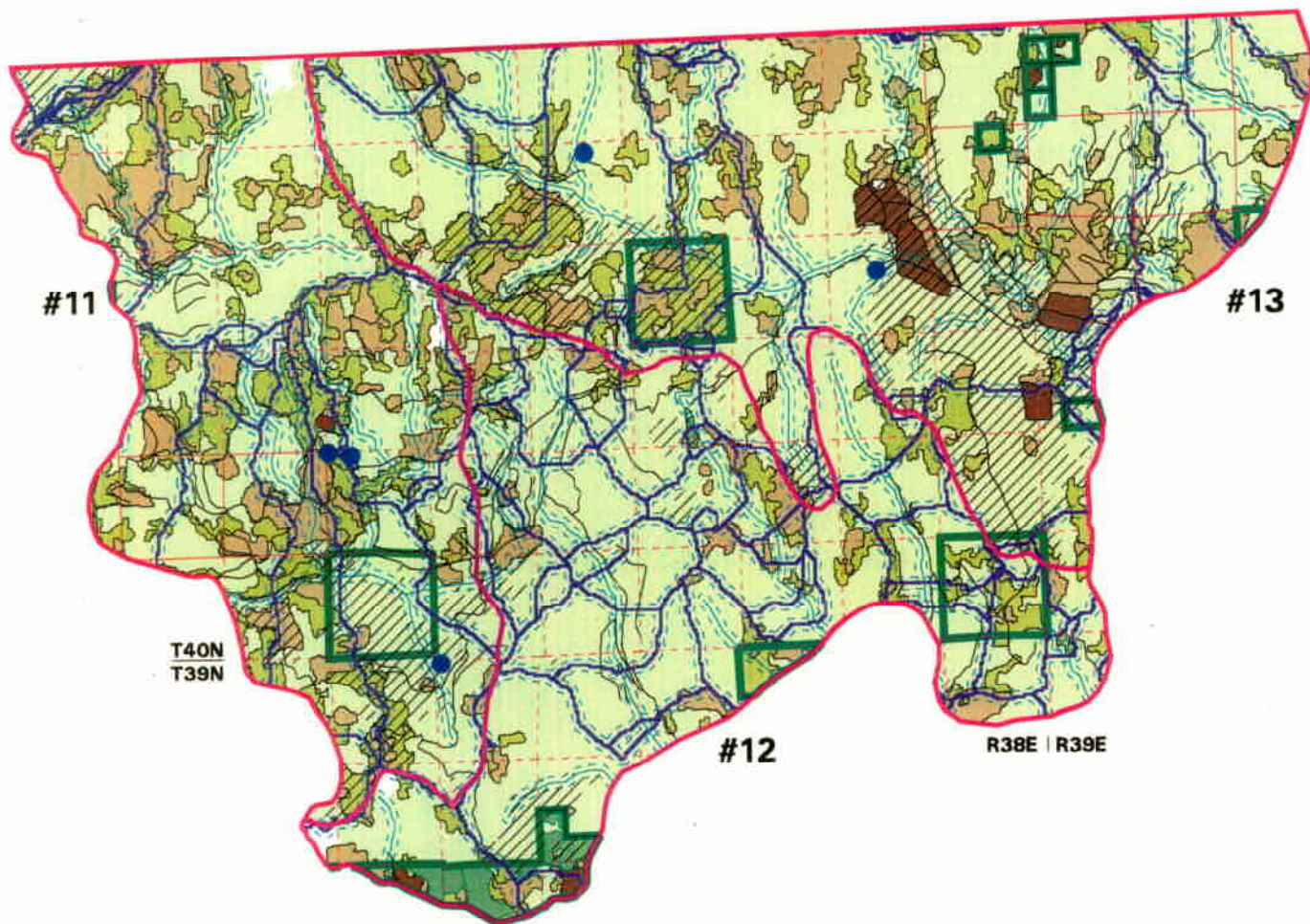
4.3.4.3 Current Conditions and LAU-Specific Recommendations

LAU 11






Douglas fir, western larch, and western red cedar were the primary species indicated by inventory records to be present on the section (mi²) on Pierre Creek (Fig. 24b). The section is characterized as Travel Habitat, with small stands of Forage Habitat and Temporary Non-lynx Areas (approximately 20% total) in the southwest corner (Fig. 23). Two ridges and one stream connect DNR-managed land with Travel Habitat to the north and south. Forested conditions will be maintained along these routes. Although there are no high volume Potential Denning Habitats within DNR's portion of the LAU, N/NE aspects cover >50% of the section. These areas will be surveyed for potential den sites.

Habitat conditions identified by this mapping effort and inventory records indicate that this block has high potential to be managed for lynx habitat. For example, two stands of lodgepole pine (primary species) appear to occur between two ridge travel routes, along Pierre Creek. These stands are separated by a western red cedar stand and have a north-northeast aspect. If a den site

Figure 23: Current lynx habitat components within the Wedge Lynx Management Zone. Areas shaded in white indicate that habitat data was not available.



Lynx Habitat

-  Forage (Early Seral) - > 10% and < 70% crown closure of Conifer, and 75% Hardwood/Shrub
-  Denning Conifer BF > or = 18,000
-  Temporary Non-Lynx
-  Travel
-  North or Northeast Slopes

-  Lynx Occurrences
-  DNR Managed Land
-  Lynx Analysis Units





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Resource Planning and Asset Mgmt. Div.

Map produced: July, 95

Permanent Non-Lynx Habitat

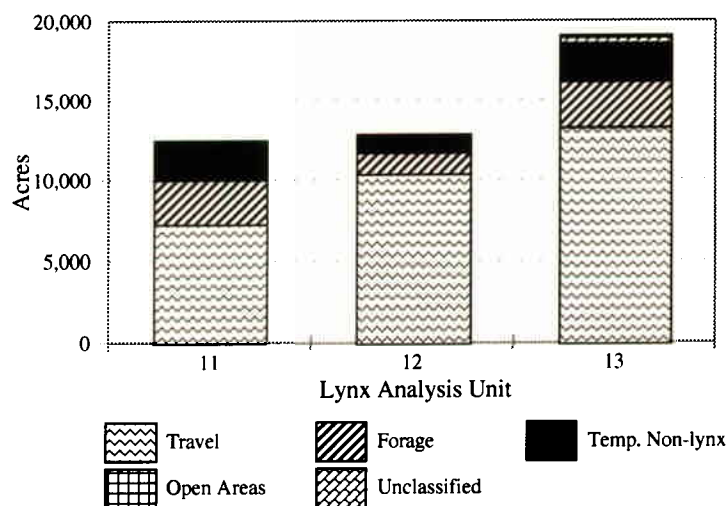
-  Open or Sparsely Forested
-  Open Water

Travel Routes

-  Ridges and Saddles
-  300ft. Buffer
-  Rivers or Streams
-  300ft. Buffer



a) Habitat categories within Lynx Analysis Units containing DNR-managed land:



b) Primary species on DNR-managed land:

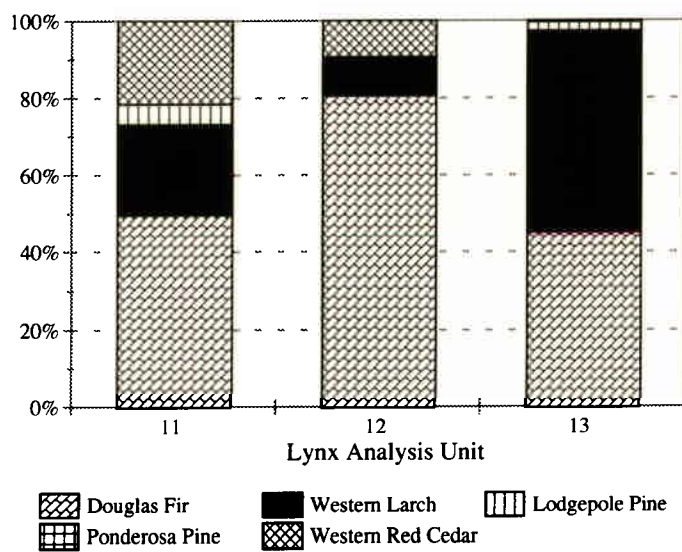


Figure 24: Characteristics of lynx habitat on LAU's containing DNR-managed lands within the Wedge LMZ: a) habitat categories, and b) primary species (from satellite data/inventory).

were located within the cedar stand, this stand could become excellent Denning Habitat. The adjacent lodgepole stands could be managed for Forage Habitat to provide a nearby source of prey. Also, the river/stream route along Pierre Creek might supply Forage habitat. Young hardwood components of the nearby southeast facing stands might also contribute Forage Habitat. Lynx could access the area along Pierre Creek or ridge travel routes.

LAU 12

DNR manages 10% of the lynx habitat within this LAU (Table 17). Current conditions within the LAU include 11% Forage Habitat and 8% Temporary Non-lynx Areas. Future harvest plans should minimize new road construction and consider incorporating provisions for road closure, because road density is high (1.5 mi/mi² in this LAU).

The Belshazzar Mountain section (mi²) straddles LAU 12 (Fig. 23). Forage Habitats are interspersed in Travel Habitat, with many intersecting ridges to provide connectivity. Inventory data indicates the presence of red cedar, western larch, and Douglas fir as primary species. As the current Forage Habitat grows out of high quality status, future harvest activities in the southwest corner of the block should be considered, in order to provide future Forage Habitat. Forage Habitat within the block is currently valuable to the area due to the lack of other nearby Forage Habitat, so treatments to prolong Forage conditions within the block managed by DNR may also be appropriate so that some Forage Habitat is available at all times.

On the southern border of the LAU, Forage Habitat exists along West Fork Crown Creek, along with some Open Areas and Travel Habitat. Treatments to prolong Forage conditions should be considered as there are few other Forage opportunities available near the block.

In the southern-most part of the zone (northeast of Mineral Mountain), inventory records indicate high volume Potential Denning Habitat dominates DNR-managed lands. These stands are nearly all Douglas fir, by primary species (Fig. 24a), and a portion occurs on a N/NE slope. Some Open Areas, a small stand of Forage Habitat, and a Temporary Non-lynx Area are also found here. A north-south ridge connects this area with Travel Habitat adjacent to the LAU, which will be managed for Forested Habitat. The Open Areas and presence of ponderosa pine (primary species) suggest that growing conditions may be dry and therefore not conducive to producing dense browse for snowshoe hare in this area. Treatments to maintain forested conditions should therefore be considered, rather than treatments to create Forage Habitat. Also, the high density of Potential Denning Habitat indicated by the inventory suggests that there may be den sites within this block. The areas will be surveyed for den sites before harvest.

LAU 13

The largest block managed by DNR within this LAU is dominated by Forage Habitat and well-connected to Travel Habitat within the zone (Fig. 23). Potential Denning Habitat occurs on a N/NE aspect near the American Fork of Big Sheep Creek, adjacent to a mixture of habitat types. This area will be surveyed for potential den sites before harvest. Primary species in the parcel managed by DNR included Douglas fir and western larch (Fig. 24b). This LAU has the highest density of ridges and saddles of all LAU's (1.3 mi/mi^2) and the third highest density of rivers and streams (0.6 mi/mi^2). Therefore, connectivity will be maintained via forested travel routes.

North of Big Sheep Creek, there is a combination of habitats in a block along a river/stream travel route (northern most block, Fig. 23) and a stand of Forage Habitat. Douglas fir was the primary species of both areas. Future management activity here will promote lynx travel conditions along the stream to encourage travel between Washington and British Columbia. Due to the block's proximity to British Columbia, coordination with adjacent landowners should be considered to avoid connectivity constraints associated with creation of Temporary Non-lynx Areas (LMZ Guideline 2).

The other two small blocks along the eastern border of the LAU are mostly forested, with some Temporary Non-lynx Areas (north of Big Sheep Creek). The block south of Big Sheep Creek contains one east-west ridge travel route. The primary species were Douglas fir, western larch, and ponderosa pine. Small Ecosystem guidelines will be applied here, and forested conditions will be maintained along the travel route.

4.3.5 Little Pend Oreille Lynx Management Zone**4.3.5.1 Importance to Lynx**

The southern half of this narrow and constricted LMZ has been subject to much habitat alteration. Only the northern portion, within five miles of its limited connection to British Columbia, is now thought to be contiguous enough to support lynx, but signs of lynx have not been observed here since 1980 (WDW 1993). Although legal trapping was historically light within the LMZ, a significant decline in lynx density has been reported. The estimated lynx population in this zone is 10-15 animals.

4.3.5.2 General Characteristics

This LMZ contains parts of the Upper Lake Roosevelt, Colville, and Pend Oreille WRIA's (Table 17) and is stratified by 9 LAU's (#14-22). The 158,455 acres (640 km^2) are found within Stevens

and Pend Oreille Counties. Most of this LMZ has potential to be forested lynx habitat (99.5%, Table 16), with 122 acres (49 ha) of Open Water and 817 acres (330 ha) of Open Areas, mainly in the central portion of the LMZ (Fig. 25, entire LMZ; Fig. 28, Open Water location).

DNR-managed lands are mostly within the Colville WRIA, covering approximately 13% of the LMZ (Fig. 25). This is the second highest concentration of DNR jurisdiction of all LMZ. The most important sections for connectivity are within the center of the LMZ, at its widest point, where it angles to the east (Sullivan Lake). The remaining lands are scattered in four $\leq 1 \text{ mi}^2$ parcels north of the central area, and one small parcel south of the central area. Portions of the main north-south ridge travel route within the LMZ are managed by DNR and therefore require special management recognition.

Most of the LMZ is currently useable by lynx (82% Forested, Fig. 26a). However, it probably lacks the Forage Habitat needed to sustain a population of lynx (5% Forage). With 16% in Temporary Non-lynx Areas, this situation should be improving in the near future. Most of the current Forage Habitat is in the north and central part of the LMZ. A diversity of primary species appeared to occur on stands managed by DNR in this zone (Fig. 26b), with Douglas fir and Western Hemlock as the most common.

4.3.5.3 Current Conditions and LAU-Specific Recommendations

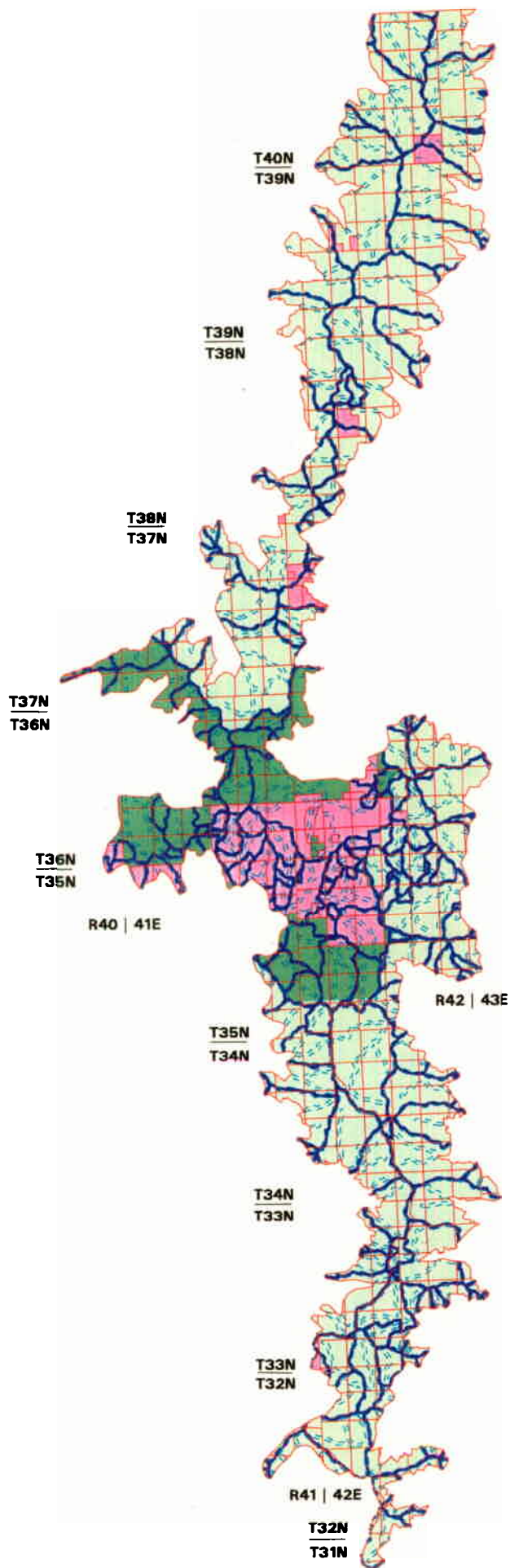
LAU 14

Near Windy Ridge, between the South and West forks of Silver Creek (Fig. 27), the small blocks of DNR-managed land within this LAU may be important to lynx for their inaccessibility (unroaded) and primary species (larger block, entirely lodgepole pine; smaller block, entirely Douglas fir; Fig. 26b). There were no high volume stands to indicate Potential Denning Habitat within the blocks, but the north/northeastern aspects should be investigated for den sites. The blocks are well-connected to surrounding forested areas, with one bisected by a NW-SW ridge. Both blocks are entirely forested but offer no forage opportunities to lynx.

There is one small stand of Forage Habitat north of the largest block and several scattered along the eastern edge of the LAU, however, the LAU is dominated by Travel Habitat (Fig. 27). It is difficult to say whether the need for forage in this area overwhelms the need for forested refugia. Given the scarcity of roadless areas available to lynx in this LAU, harvest activities should be delayed in this area until the Temporary Non-lynx Areas along the eastern edge of the LAU and southern areas of the LMZ grow into Forage Habitat. Also, priority for creation of Forage Habitat might be higher within the lodgepole pine block than the Douglas fir block, until more is learned about the use of Douglas fir stands by hares in this region.

Figure 25: DNR-managed lands within the Little Pend Oreille Lynx Management Zone.

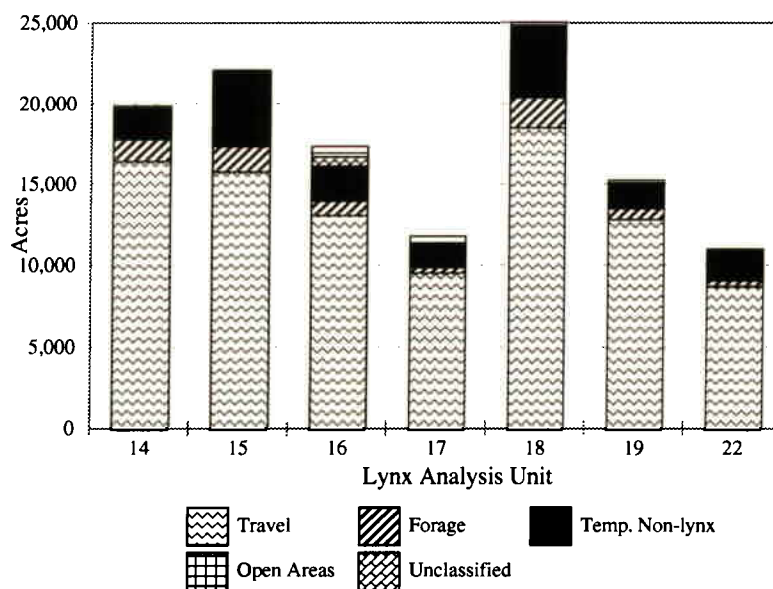
Pend Oreille Lynx Management Zone



Key

- LAU -- Habitat Targets Applied
- DNR Managed Land
- Ridges and Saddles
- 300ft. Buffer
- Rivers or Streams
- 300ft. Buffer
- Public Land Survey Section Lines

a) Habitat categories found within Lynx Analysis Units containing DNR-managed land:



b) Primary species on DNR-managed land:

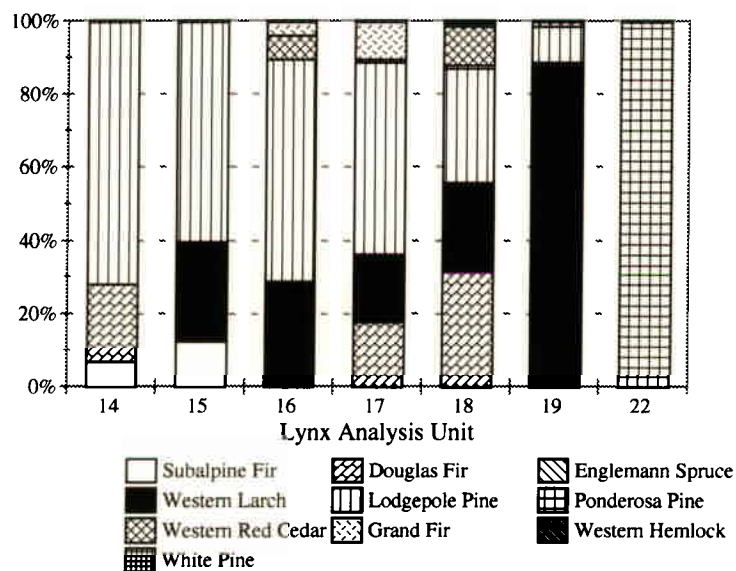


Figure 26: Characteristics of lynx habitat on LAU's containing DNR-managed lands within the Little Pend Oreille LMZ: a) habitat categories, and b) primary species (satellite data/inventory).

Figure 27: Current lynx habitat components within the Pend Oreille Lynx Management Zone: LAU 14 and 15. Areas shaded in white indicate that habitat data was not available.



T40N
T39N

#14

#15

R42E R43E

T39N
T38N

Travel Routes

- Ridges and Saddles
- 300ft. Buffer
- Rivers or Streams
- 300ft. Buffer

- Lynx Occurrences
- DNR Managed Land
- Lynx Analysis Units

Lynx Habitat

- Forage (Early Seral) - > 10% and < 70% crown closure of Conifer, and 75% Hardwood/Shrub
- Denning Conifer BF > or = 18,000
- Temporary Non-Lynx
- Travel
- North or Northeast Slopes

Permanent Non-Lynx Habitat

- Open or Sparsely Forested
- Open Water



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LAU 15

The section near Abercrombie Mountain straddles LAU 14 and has a good mix of lynx habitat (approximately one third each of Temporary Non-lynx, Forage, and Travel Habitats).

Considering that Forage Habitat in this section is 1) well-connected via ridges and Flume Creek to Travel Habitat, 2) potentially contains lodgepole pine as the primary species (4/5 stands), and 3) limited in this LAU overall (Fig. 27), the Forage Habitat and Temporary Non-lynx Areas in this section are critical resources to the LAU. There were no high volume stands or north/northeastern aspects to indicate Potential Denning Habitat within the block, but the areas will be investigated for den sites before future harvest activities. The northeastern subalpine fir stand will be the highest priority for searches, given its classic denning primary species (Koehler and Brittell 1990). DNR manages a critical part of the major N-S travel route that runs the length of the northern portion of the LMZ. Most of this ridge may currently be too open for use by lynx. Therefore, future harvest activities should continue to maintain a north-south travel route through the section, as an alternative to the unforested ridge.

Another block of habitat south of South Fork Jim Creek straddles LAU 16 (Fig. 27, 28). It has value as lynx habitat because of its relative inaccessibility and critical position at a constriction in the LMZ. A ridge runs east-west across the block. Forested Habitat will be maintained along this travel route. Most of the block is forested, except a Temporary Non-lynx Area just south of the ridge. Inventory indicates that this was once a lodgepole pine stand (primary species), so this site may have good Forage potential. North of the ridge, the primary species was western larch. This area has a north-northeast aspect and will be surveyed for potential lynx den sites. Future harvests units in this block will promote connectivity within the LMZ, leaving north-south forested travel routes through the block.






LAU 16

On the western border of the LAU, near Byers Creek, inventory data indicate the presence of grand fir and western red cedar stands (Fig. 28). The stands are currently classified as Travel Habitat, with no ridge or river/stream travel routes. This block is at the narrowest point in the LMZ, so future harvest units will be oriented to promote connectivity within the LMZ, leaving a northeast-southwest travel route through the block.



Northeast of Seldom Seen Mountain, the largest block of DNR-managed habitat in this LAU is mostly unroaded. The stands within the area are currently classified as Travel Habitat and there are several ridges in the block to provide connectivity (Fig. 28). Forested conditions will be maintained along these travel routes. Although there were no high volume stands to indicate Potential Denning Habitat, almost the entire area has a north or northeast aspect and will therefore be surveyed for possible den sites. The value of the area for den sites may be especially important in the southern portion of the block, where DNR-managed land is bordered by Forage Habitat. The predominance of lodgepole pine as a primary species, good connectivity, and

Figure 28: Current lynx habitat components within the Pend Oreille Lynx Management Zone:
LAU 16. Areas shaded in white indicate that habitat data was not available.








Lynx Habitat

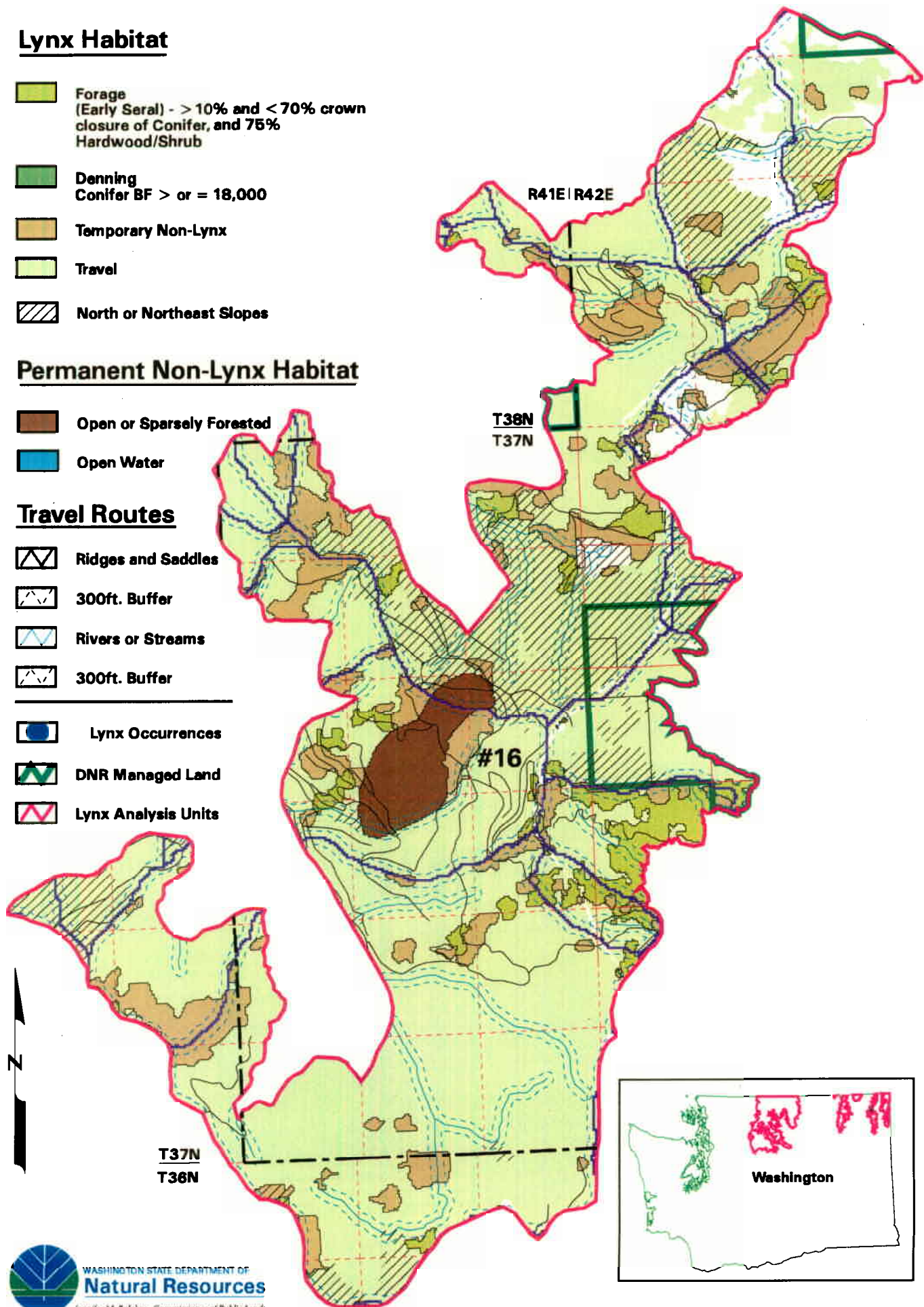
-  Forage
(Early Seral) - > 10% and < 70% crown
closure of Conifer, and 75%
Hardwood/Shrub
-  Denning
Conifer BF > or = 18,000
-  Temporary Non-Lynx
-  Travel
-  North or Northeast Slopes

Permanent Non-Lynx Habitat

-  Open or Sparsely Forested
-  Open Water

Travel Routes

-  Ridges and Saddles
-  300ft. Buffer
-  Rivers or Streams
-  300ft. Buffer
-  Lynx Occurrences
-  DNR Managed Land
-  Lynx Analysis Units



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dominance of Travel Habitat within the northeastern portion of the block suggests that this area is an appropriate place to create future Forage Habitat for lynx.

LAU 17

DNR manages 14% of the lynx habitat within this LAU (Table 17). Current conditions within the LAU include 3% Forage Habitat and 13% Temporary Non-lynx Area. Harvest plans should minimize new road construction and consider road closure measures, because road density is high in this LAU (2.1 mi/mi²).

Stands south of Hansen Creek in the southwestern edge of the LAU contain a mixture of habitat types, potentially Douglas fir and western larch by primary species. Forage Habitat is interspersed with Temporary Non-lynx Areas and Travel Habitat, connected by ridges (Fig. 29, second highest of all LAU's = 1.11 mi/mi²). Although the presence of Potential Denning Habitat was not indicated by high volume stands, there are stands with north-northeast aspects that will be surveyed for den sites. New harvest units should be delayed until the Temporary Non-lynx Areas mature into Forage Habitat. Given the lack of nearby Forage Habitat, active management should be considered to maintain browse conditions in existing Forage Habitat if feasible.

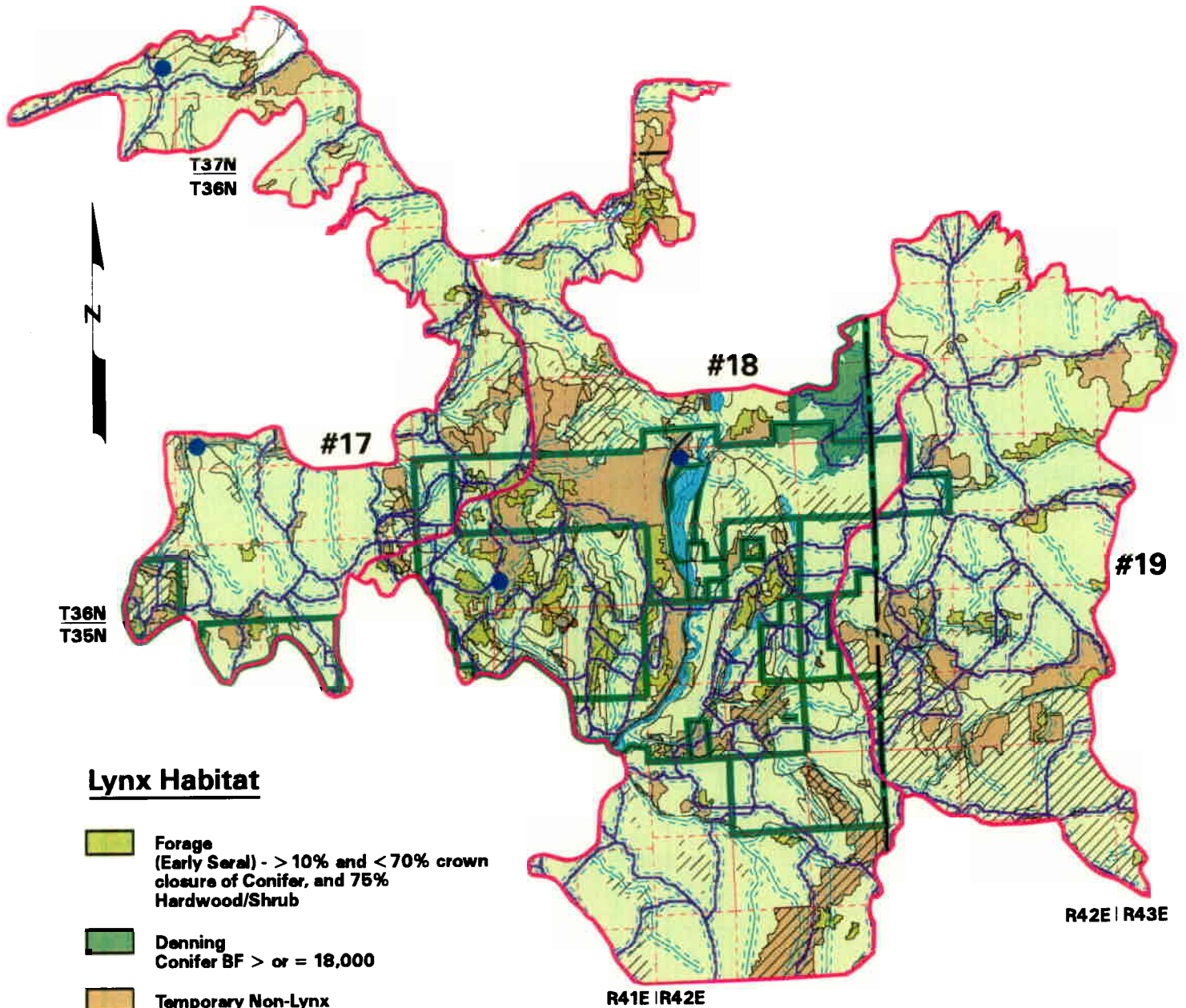
The stands near Squaw Creek (western larch and lodgepole pine, by primary species) are mostly classified as Travel Habitat, except in the northwestern section of the block where Temporary Non-lynx areas and Forage Habitat exists. The block is connected to Travel Habitat via forested ridge and river/stream travel routes. Forested Habitat will be maintained along these routes. No high volume Potential Denning stands were present, but riparian areas near Squaw Creek and Narcise Creek will be investigated for den sites prior to harvest. The creation of Temporary Non-lynx Areas should be considered within the lodgepole pine stands of the southeastern portion of the block.

Stands in the Middle of the LAU are mostly classified as Travel Habitat, with some Forage Habitat along the eastern border, dominated by lodgepole pine (primary species). DNR-managed land is generally well-connected to Travel Habitat within the LAU. However, this block is in a strategic position to prevent or promote access to the west arm of the LAU. Future harvest activities will maintain a forested northeast-southwest travel route through this block. This block will be lumped with adjacent DNR-managed land in LAU 18 (Little Pend Oreille Block) for application of LAU-level habitat ratios throughout the planning period (Table 18, Fig. 25).

LAU 18

This LAU contains the only area managed by DNR outside of the Loomis State Forest that is large enough to potentially support an entire lynx home range (Fig. 25, 29). DNR manages 57.1% of the lynx habitat within this LAU (Table 17); therefore the LAU-scale habitats ratios

Figure 29: Current lynx habitat components within the Pend Oreille Lynx Management Zone: LAU 17, 18, and 19. Areas shaded in white indicate that habitat data was not available.



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Table 18: Current lynx habitat components on DNR-managed lands within the Little Pend Oreille Block (LAU 18 and adjacent DNR-managed lands from LAU 17 and 19).

	Lynx Habitat	Forage Habitat	Denning Habitat	Travel Habitat	Temporary Non-lynx
Acres	15,178	381	700	12,158	2,039
	(97%)	(3%)	(5%)	(80%)	(13%)

(Guideline 4) will be applied here. Table 18 lists current habitat conditions on DNR-managed land in LAU 18 only, with adjacent DNR-managed land from LAU 17 and 19. Together, this area is known as the "Little Pend Oreille Block."

The Little Pend Oreille bisects the LAU and creates small lakes (e.g. Lake Leo), resulting in 42 acres (17 ha) of Open Water. Approximately 81% of the LAU is Forested Habitat (19% Temporary Non-lynx Area), including the highest proportion of Forage Habitat (8%) among the LAU's of the LMZ (Fig. 26a). This LAU may be the most diverse of all the LAU's managed by DNR, with ten primary species indicated by inventory records.

There are numerous creeks (including American and Flodel Creeks) and ridges providing connectivity with lynx habitat to the north and south of DNR-managed land. Although some of these ridges are Temporary Non-lynx Areas, there are alternative forested travel routes available through which lynx could travel. Forested conditions will be maintained along these travel routes in the future. The design of future harvest activities will promote connectivity through DNR-managed land to the southern half of the LMZ, by maintaining forested northwest-southeast travel routes through the block.

Much of the LAU is highly accessible. Recreational facilities include an off-road vehicle trail and a campground. Therefore, future harvest plans should minimize new road construction and incorporate provisions for road closure (Guideline 5). Road density is high in this LAU (2.1 mi/mi²).

Temporary Non-lynx Areas occur mainly west of the Little Pend Oreille River and at the southern end of the LAU (18%). These areas will provide valuable Forage Habitat in the future. However, there are few current Forage stands in the northeastern corner of the block. Inventory data indicates that many of these areas are high volume Potential Denning Habitats. These sites will be surveyed for den sites and potential to meet the 10% Denning Habitat ratio. Future harvest activity will be planned south of these stands to provide forage for denning lynx.

LAU 19

DNR-managed habitats within this LAU (Fig. 29) are all classified as Travel Habitat and included with LAU 18 (Little Pend Oreille Block) for application of LAU-level habitat ratios. Within these blocks, there are several ridge and one river/stream travel routes (South Fork Lost Creek) to provide connectivity between DNR-managed lands and other lynx habitat. Forested conditions will be maintained along these travel routes. Most of the acres were dominated by lodgepole pine, by primary species. There were no high volume stands to indicate Potential Denning Habitat, but a small area with a north-northeast aspect occurs in the southern portion of DNR-managed lands within the LAU. This area will be surveyed for den sites. Foraging opportunities (4%, Fig. 26a) within the LAU should improve as the Temporary Non-lynx Areas (10%) mature. Consideration should be given to planning Temporary Non-lynx Areas in the northern portion of the blocks to provide future Forage Habitat within the LAU, especially in proximity to Denning Habitat identified in LAU 18.

LAU 22

The 173 acre (70 ha) parcel near Tenmile Creek on the western edge of the LAU (Fig. 25) is mostly forested (subalpine fir with some ponderosa pine, Fig. 26b). Most of the subalpine fir stands were in the southern portion of the block, including the high volume Potential Denning Habitat. This stand is near both current Forage Habitat and Temporary Non-lynx Areas outside of DNR jurisdiction, which should allow denning lynx access to prey. The ridge that might provide connectivity to the area from Travel Habitat within the LAU is classified as a Temporary Non-lynx Area, but alternative forested travel routes through the area are available. In the future, forested conditions will be maintained along the ridge travel route. of the LAU. Although the LAU-level habitat ratios will not be applied to this block, the indicated Potential Denning Habitat will be surveyed for possible den sites according to the Small Ecosystem Guidelines.

4.3.6 *Salmo Priest Lynx Management Zone***4.3.6.1 Importance to Lynx**

The eastern most LMZ is classified as capable of supporting the second most viable lynx population through its 1) connection to British Columbia and Idaho, 2) relatively large size, 3) historical and current occupancy by lynx, 4) potential for management, and 5) inaccessibility (i.e. low road density). The decline of lynx in this LMZ has only been described as moderate despite removal of 11 animals from 1974-1977 and additional suspected poaching losses (WDW 1993).

The estimated lynx population in this LMZ is 19 animals. Due to its constriction in several places, the southern portion of the LMZ is less likely to sustain a large number of resident animals than the northern half (WDW 1993).

4.3.6.2 General Characteristics

Located entirely within Pend Oreille County and WRIA (Table 17; 182,386 acres, 737 km²), this LMZ is subdivided by seven LAU's. Most of this LMZ (99.6%) has potential to be forested lynx habitat, with 191 acres (77 ha) of Open Water and 640 acres (259 ha) of Open Areas scattered largely to the east of the central crest (Fig. 30).

DNR manages 2% of the LMZ (Table 17), dispersed in parcels along the southeast edge of the LMZ within three LAU's. Most of the DNR-managed land is within LAU 28 (Middle Creek WAU), with one square mile each in LAU 27 and 29. Although none of the main north-south ridge travel routes are within these areas, there are important east-west routes (both river/stream and ridge) that will be managed as travel corridors.

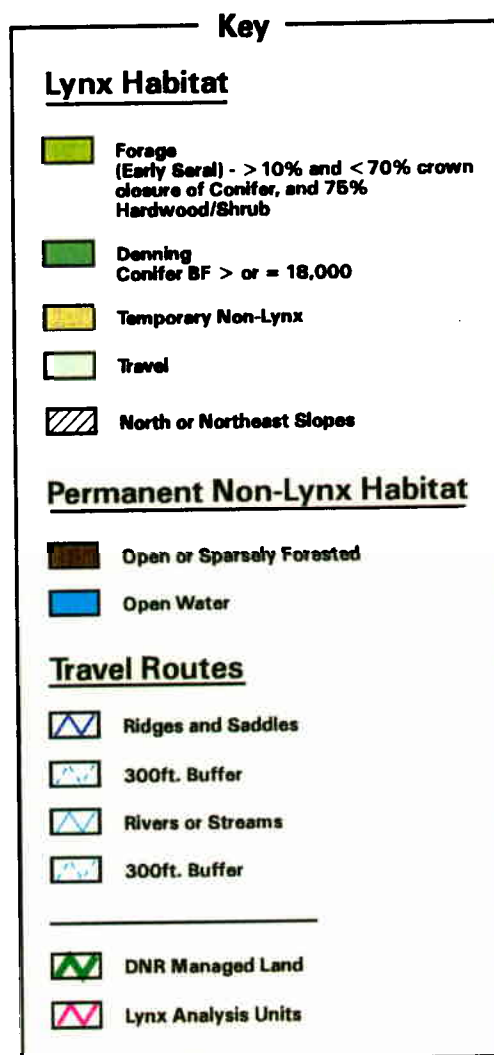
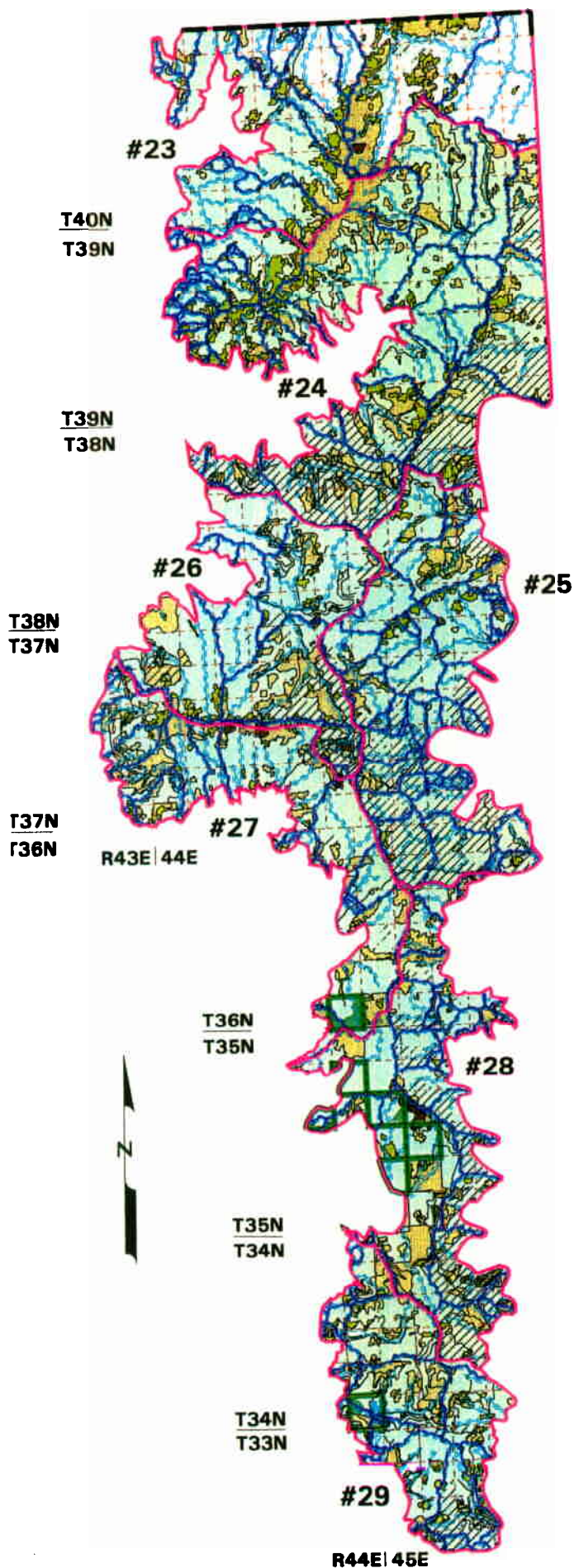
Although most of this LMZ is currently suitable for use by lynx (81% Forested lynx habitat), it probably lacks the Forage Habitat to support a dense population of lynx (Forage Habitat = 6%, Fig. 31a). The cluster of Forage Habitat in the northwest corner of the LMZ may make this area the most conducive of the LMZ to current lynx occupation. The value of these Forage Habitats are accentuated by their remote and protected Wilderness status (Salmo Priest) as well as their connection to British Columbia and Idaho. As the 18% Temporary Non-lynx Areas mature, suitability in this LMZ should be improving for lynx.

4.3.6.3 Current Conditions and LAU-Specific Recommendations

LAU 27

Due to their relatively large components of potentially palatable species (Fig. 31b, lodgepole pine and western red cedar, by primary species), DNR-managed lands within this LAU (near 4th of July Peak) may have good potential as Forage Habitat (Fig. 32). They have high potential to support Potential Denning Habitat due to the combination of aspect and high forest volume, as well as the connectivity provided by Seco Creek and a ridge travel route. Much of the adjacent land has been recently harvested, increasing the value of this section as travel corridors or Denning Habitat. After the adjacent Temporary Non-lynx Areas grow into Forage Habitat, consideration should be given to planning small Forage units within the northwestern corner of DNR's section to allow Temporary Non-lynx opportunities for lynx. Future harvest units will be designed to promote lynx travel through this narrow portion of the LAU by maintaining north-south forested corridors through the block.

Figure 30: Current lynx habitat characteristics within the Salmo Priest Lynx Management Zone. Areas shaded in white indicate that habitat data was not available.



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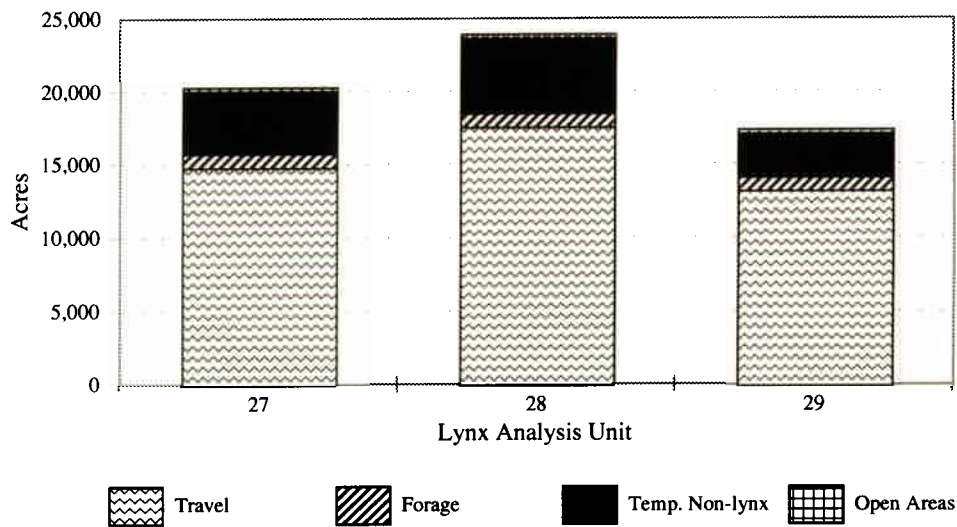
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a) Habitat categories within Lynx Analysis Units containing DNR-managed land:



b) Primary species on DNR-managed lands within the LMZ:

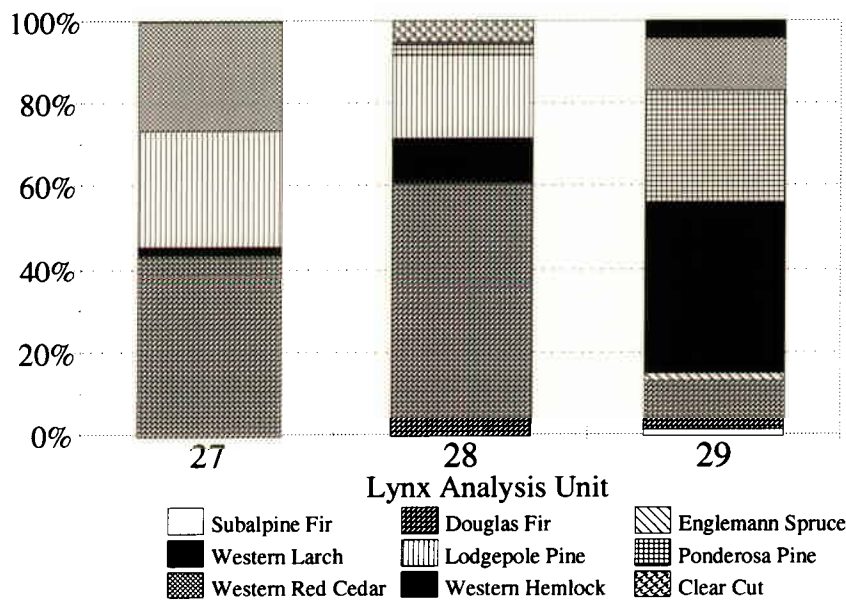
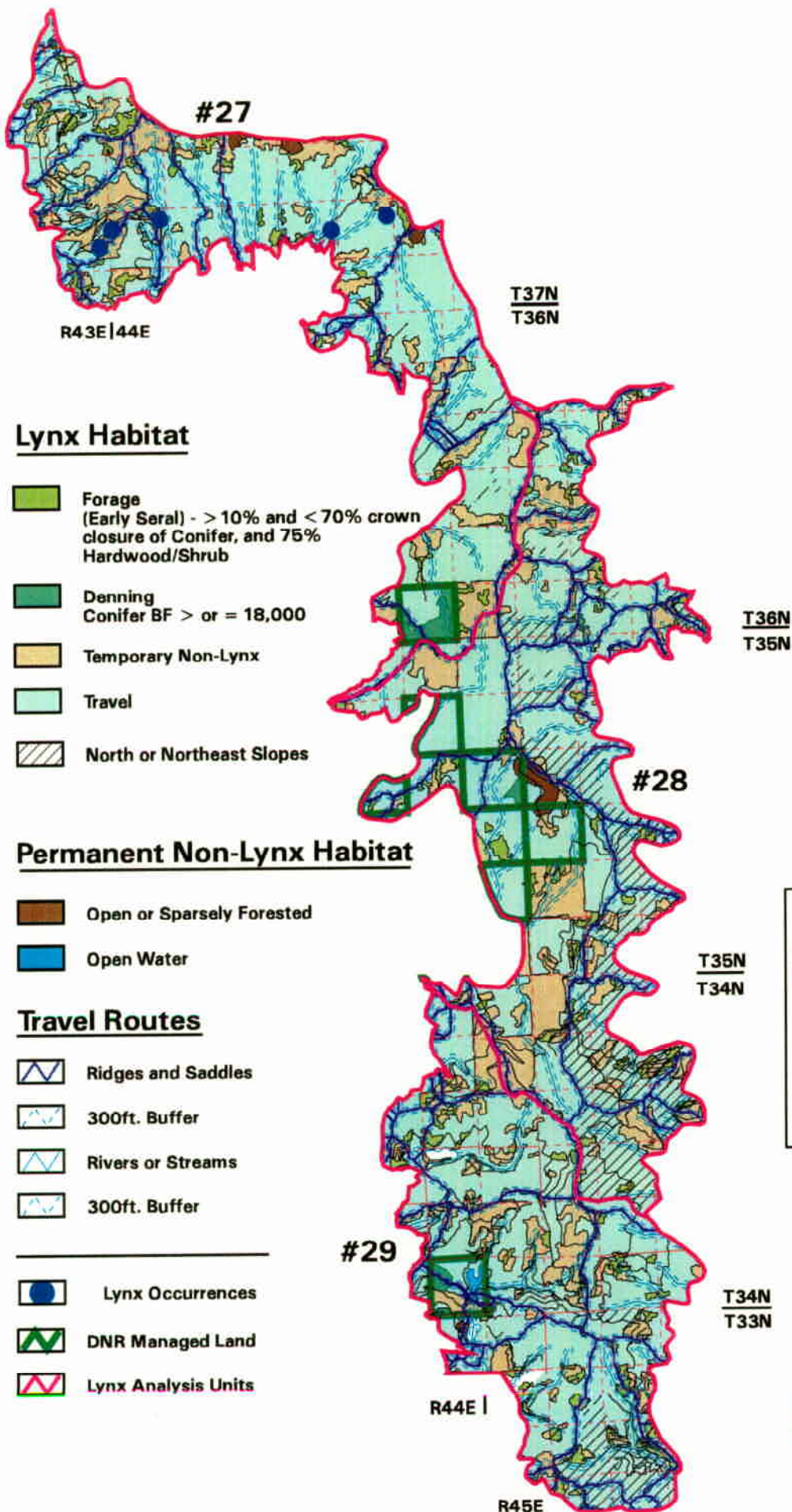


Figure 31: Characteristics of lynx habitat on LAU's containing DNR-managed lands within the Salmo Priest LMZ: a) habitat categories, and b) primary species (from satellite data/inventory).

Figure 32: Current lynx habitat components within the Salmo Priest Lynx Management Zone: LAU 27, 28, and 29. Areas shaded in white indicate that habitat data was not available.



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LAU 28

DNR manages 10% of the lynx habitat within this LAU (Table 17). Current figures for the LAU are 11% Forage Habitat and 8% Temporary Non-lynx Area. Future harvest plans should minimize new road construction and consider incorporating provisions for road closure, because road density is high (2.2 miles/mi²) in this LAU.

DNR-managed land is mostly forested within this LAU (Fig. 32). Inventory records indicate that a mix of species is present that might provide Forage Habitat, including Douglas fir and lodgepole pine. Future harvest units will be carefully designed to promote connectivity through the LMZ, by maintaining a north-south forested travel route through the blocks. Large cut blocks in the southern portion of the LMZ may temporarily discourage lynx from traveling through the area, but may become an attraction as these large areas grow into Forage Habitat. An east-west ridge and Middle, Sylvis, and Nola Creeks provide connectivity through DNR-managed land, and will be maintained as forested travel routes.

LAU 29

This LAU may have the lowest potential as lynx habitat of all the LAU's with DNR-managed land in this LMZ because of the 1) collection of Temporary Non-lynx Areas at the constricted point to the north, 2) presence of high access areas, 3) presence of recreational use areas (North Skookum Lake, 54 acres, 22 ha), and 4) the relatively common occurrence (28%) of ponderosa pine (indicates xeric and sparsely forested areas often avoided by lynx, Koehler 1990a). However, the 1 mi² section managed by DNR in the LAU has a diversity of habitat categories and is well connected to surrounding forests. The block of high volume timber straddling the ridge may become important Potential Denning Habitat as the adjacent Temporary Non-lynx Area grows into use by hares (Fig. 32). At that time, consideration should be given to placing small harvest units in the northwest corner of the section provide future lynx Forage Habitat.

Table 19: Summary of current conditions within LAU's containing DNR-managed lands by habitat component in acres (% of lynx habitat). Data from North, Central, and South LAU's was derived from a different database than the other LAU's (see text 4.1).

LAU	Lynx Habitat	Forage Habitat	Denning Habitat*	Travel Habitat	Temp. Non-Lynx Areas	Unclassified
<i><u>Okanogan</u></i>						
North	22,132 (88% of LAU)	52 (0%)	1,906 (9%)	18,218 (82%)	1,956 (9%)	-----
Central	31,005 (92%)	0 (0%)	839 (3%)	24,994 (81%)	5,172 (17%)	-----
South	26,413 (86%)	504 (2%)	921 (3%)	21,493 (81%)	3,495 (13%)	-----
Other	50,369 (96%)	16,317 (32%)	456 (1%)	12,613 (25%)	5,919 (12%)	10,714 (21%)
<i><u>Vulcan Mountain</u></i>						
1	4,056 (96%)	1,200 (30%)	0	1,511 (37%)	1,345 (33%)	-----
<i><u>Kettle Range</u></i>						
3	25,542 (97%)	3,469 (14%)	0	16,438 (64%)	5,635 (22%)	-----
4	17,700 (98%)	2,081 (12%)	0	12,586 (71%)	3,027 (17%)	6 (0%)
6	17,651 (98%)	1,565 (9%)	0	13,586 (77%)	2,327 (13%)	173 (1%)
7	28,889 (99%)	5,102 (18%)	0	18,124 (63%)	5,589 (19%)	74 (0%)
<i><u>The Wedge</u></i>						
11	12,426 (100%)	2,776 (22%)	0	7,235 (58%)	2,364 (19%)	51 (0%)
12	12,719 (99%)	1,344 (11%)	311 (2%)	10,060 (79%)	961 (8%)	43 (0%)
13	18,608 (98%)	2,943 (16%)	10 (0%)	13,268 (71%)	2,383 (13%)	4 (0%)

Table 19 (cont.): Summary of current conditions within LAU's containing DNR-managed lands.

LAU	Lynx Habitat	Forage Habitat	Denning Habitat	Travel Habitat	Temp. Non-Lynx Areas	Unclassified
<i><u>Pend Oreille</u></i>						
14	19,733 (100%)	1,361 (7%)	0	16,481 (83%)	1,894 (10%)	37 (0%)
15	21,926 (99%)	1,520 (7%)	0	15,867 (72%)	4,494 (20%)	45 (0%)
16	16,785 (97%)	901 (5%)	0	13,144 (78%)	2,147 (13%)	593 (3%)
17	11,698 (100%)	299 (3%)	0	9,603 (82%)	1,501 (13%)	295 (3%)
18**	23,402 (100%)	381 (2%)	701 (3%)	17,827 (76%)	4,460 (19%)	33 (0%)
19	15,202 (100%)	671 (4%)	0	12,857 (85%)	1,649 (11%)	25 (0%)
22	10,941 (100%)	366 (3%)	30 (0%)	8,691 (79%)	1,830 (17%)	24 (0%)
<i><u>Salmo Priest</u></i>						
27	20,125 (99%)	1,003 (5%)	335 (2%)	14,447 (72%)	4,340 (22%)	-----
28	23,638 (99%)	1,043 (4%)	59 (0%)	17,489 (74%)	5,047 (21%)	-----
29	17,094 (99%)	948 (6%)	111 (1%)	13,064 (76%)	2,971 (17%)	-----

*Denning Habitat was not determined from satellite images used to estimate lynx habitat components outside the Loomis State Forest. Acres indicated represents DNR-managed land only.

**For current habitat components for lands managed by DNR within and adjacent to LAU18, see Table 18.